User-Friendly and Learner-Friendly Courseware Design, Development and Evaluation

By

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Dedication

To my beautiful mentor Dr Thao Le. Your encouragement, expertise and support inspired my journey. You offered me a beacon, and showed me the door at the end of the journey. I am so grateful my path was led to yours. Thank you.

To my wonderful Angus Wallace. Your endless love, financial and emotional support made it possible for me to complete this study. You refuelled the beacon, kept it going when the light was dimming, and held my hand along the journey. This is our journey. We open the door together. We shut it hand in hand.

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To the participants in this study – students, academics and experts, who gave their time and attention to this study. Also, to participants on the international educational technology ITFORUM and IFETS listservs, who provided ongoing feedback and support.

Abstract

The design of eLearning courseware has become an important area of research within contemporary Higher Education. The literature and practice of designing eLearning indicates that the role of user-friendly and learner-friendly design as it applies to fully-online courseware is yet to be established. When it comes to user-friendly design, an established set of heuristics is still in development, as researchers' investigate the impact an additional requirement of learning has on traditional user-friendly design. When it comes to learner-friendly design, there are still questions in regards to the features that contribute to effective pedagogical design. The design, development and evaluation of fully-online courseware based on a constructivist philosophy for ill-structured problem types, is yet to be discussed in-depth within the literature. In particular, it is not clear whether learners' perspectives differ from that of academics and professional courseware designers. This thesis attempts to address these gaps in the literature through a mixed-methods approach. Firstly, a questionnaire survey is used to obtain statistical and open-ended data on teaching and learning online, user-friendly design, and learner-friendly design, from a range of students, academics, and professionals. Secondly, a fully-online prototype courseware on Intercultural Communication aimed at first-year university students, has been designed and developed by the researcher. A sample group of participants evaluate this courseware, through open-ended interview and email feedback. The results are bought together to present a range of contemporary perspectives on some specific aspects of user-friendly and learner-friendly courseware design.

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Chapter 1: Introduction

1.1 Introduction

This research journey really began ten years ago, when the researcher was an undergraduate student and had designed her first courseware as part of a Computer Aided Learning course. This led to an interest in the way computers may be used to help people learn online, and it triggered the importance of incorporating both user-friendly design principles and learning principles in designing educational media. Five years after designing that first courseware, the researcher embarked formally upon this journey, by enrolling in a Masters degree by research. After investigating the literature on the design of courseware within teaching and learning online, the researcher found that there were significant gaps in the literature that she would like to explore. In particular, the researcher found that the literature tended to focus on either the user-friendly design or the learner-friendly design of courseware, rather than melding the two approaches into a whole design methodology. A further investigation of the literature found that the literature on user-friendly design tended to focus on traditional design methodologies, as opposed to user-friendly design as it applies specifically to learning. Furthermore in relation to the literature on the learner-friendly design of courseware, there appeared to be a lack of consensus regarding the preferred pedagogical model on the learning design. Some academics appeared to prefer a teacher-centered methodology based on behaviourist principles, other academics appeared to prefer a learner-centered methodology based on constructivist principles, and finally other

academics argued that both behaviourist and constructivist principles could be combined effectively to form a complementary design ‘toolkit’ for learning.

Having read the theory on the design of courseware, the researcher undertook several jobs as an instructional designer in both the fields of commercial Training and Higher Education, in order to gain more experience in the practice of designing courseware. The practice of designing courseware led the researcher to new insights into the area of courseware design, and inspired the design of this research to new levels. In particular, the researcher found that one of the themes from the literature was the move in the technological and pedagogical designs of courseware from teacher/software-centered methodologies (design from the perspective of the software developer and teacher), to learner/user-centered methodologies (design which incorporates the needs of the end-user as a learner). Nevertheless, these perspectives tended to come from the professional or academic, as opposed to the learners using courseware. Thus, although a move towards learner-centered methodologies is said to have occurred, the perspectives of learners tend to be left out of the literature. Interestingly, the researcher found that this theme extended to the design of courseware in practice. In particular, the researcher found that although courseware – particularly within the realm of commercial training was often labelled as ‘innovative’, traditional design methodologies were generally applied. There appeared to be hesitation by those involved in the production of courseware against learner-centered methodologies.

The researcher gained the impression that learner-centered methodologies were considered expensive, and ‘untested’, and designers were rarely given the chance to consult learners in courseware development. It appeared that both administrators (those selling courseware) and clients (those involved in purchasing courseware), were somewhat unconvinced of the pedagogical and cost effectiveness of constructivist-oriented courseware designs, and believed there was a lack of research regarding the implementation of constructivist-oriented designs within the training sector. This perspective furthered the researcher’s interest in constructing a learner-centered courseware, which was designed according to user-friendly constructivist-oriented principles, and evaluated by a range of participants (i.e. students), and not just professionals or academics. Another effect that the researcher noticed from the software/teacher-centered approach to design was an apparent lack of understanding in regards to the effect of the user-friendly aspects of courseware design. Generally, traditional design principles on screen design and layout, navigation, and usability were applied, however it was somewhat unclear about how these features impacted upon the end-users experience as a learner. This led the researcher to a particular interest in how the technological, screen design, and navigational elements of courseware design impact upon learners. In particular, do learners’ have a different perspective regarding the design of these

user-friendly elements, compared to those involved in designing and implementing these features?

The final influencing factor guiding the researcher's personal journey on this research study was her experience as an instructional designer within the field of Higher Education. Within the commercial training industry, the researcher found that the tasks on courseware design were divided very specifically. Separate people were assigned specialised tasks. The tasks included those of instructional designer (those involved in the educational design and to some extent web design), web designer/developer (those involved in building the instructional design screens prototyped usually within a Word document), subject matter expert – SME (those involved in providing the content that the instructional designer interprets), and project manager (those involved in administering the development of the courseware, and liaising between different parties). Within the field of Higher Education however, the researcher found that instructional designers often multi-tasked as instructional designer, web designer, web developer, and project manager. In many cases, however, the researcher observed that academics did not often have the 'luxury' of an instructional designer, and thus performed the multiple roles on all aspects of courseware design themselves. In addition to this, academics were often untrained when it came to these specialised tasks, and some academics appeared to resent the time and effort involved in the design of courseware, which they weren't convinced necessarily enhanced teaching and learning in Higher Education.

This led the researcher to question whether academics have a different perspective of courseware design, compared to professionals and students? Furthermore, how do academics perceive the user-friendly and learner-friendly design of courseware, compared to students and professionals? In particular, when it came to the user-friendly design the researcher formed the impression that the aesthetics of courseware was somewhat unimportant to academics, who appeared to be more focused on the subject matter expertise and appeared to consider the 'look and feel' of the screen design as a somewhat frivolous matter. Also, when it came to the learner-friendly design, although academics tended to be familiar with the philosophical principles behind learning design, they appeared to be somewhat divided in regards to which principles to implement. In particular, there appeared to be continued to be varying levels of support of behaviourist principles, even though the literature perpetuates a move in the past decade or so, from teaching methodologies based on objectivist roots (behaviourist methodologies) toward those based on constructivist roots (Jonassen, Cernusca, and Ionas, 2007; Reiser, 2007). Thus the researcher questioned what contemporary research participants think about specific aspects of courseware design, such as those based on objectivist and constructivist roots. Furthermore, does a participants' background such as their occupation affect their opinion? These issues and questions all

propelled the researcher through this research journey, and inspired her to explore those issues which appeared to be somewhat lacking in the literature.

1.2 Teaching and Learning Online

1.2.1 Technological Revolution

Over the past thirty years computers have had a profound effect on society, changing the way we access information and use technology on a day-to-day basis. The fear of near apocalypse due to the 'Y2K Bug' in 2000 emphasises our reliance on computers. Due to a potential error in the programming language used by many computer systems, experts could not safely declare that anything run by computers would continue to function as normal after December 31st, 1999. Airports, hospitals, commercial businesses and households were preparing for a worst-case scenario, that is, life without computers. Fortunately most computer systems operated as usual on the critical date, ensuring the popularity and usage of Personal Computers (PCs) and the growth of the Internet. The PC computer is now essential to the operation of commercial and government organisations, and an increasingly important feature of Australian households. More and more businesses, schools, vocational education, Higher Education institutions and households are transferring their paper-based tasks to an electronic environment. PCs are acting as multi-tasking agents. For example, database software is being used to hold client information, bill tracking, stocktaking and financial management; work processing is used for business proposals, letter writing and note taking; and spreadsheets are being used for mathematical functions among other tasks. PCs and their accessories are also being used for new activities, previously undertaken within specific businesses, for example, scanning, editing and printing digital photos. Furthermore, the growth of the Internet has spanned a technological and cultural revolution, further affecting how we undertake daily jobs and enabling new possibilities. We may now handle our banking, pay our bills, search for products and shop, find out more about specific companies or people, access recent and past news, research most phenomena, play games, download and play multimedia and communicate synchronously (in real time, e.g. MSN chat or Skype) or asynchronously (e.g. email, blog, listserv) with friends, colleagues, potential clients and even cyber-strangers.

The Internet includes the software that connects information from one computer to another. Experts in the early 1960s wanted to exchange scientific and military information with other experts created it. The early Internet included file transferring between the client computer and server computer (FTP), other client-server interaction (Telnet) and email capabilities, as opposed to the World Wide Web (www). In 1991, the www was conceptualised at CERN in Geneva with the "sole purpose of making research findings and scientific materials available to the academic and scientific community on a global network" (Lau, 2000, p.i). From here

on, non-technical people could share files using a browser, as well as utilise the traditional FTP, Telnet and email. Perhaps as a result of its past however, many Internet applications – including web pages and communications software may not be considered user-friendly. That is, they may be designed without consideration of the end user and therefore be difficult for non-experts to use. This may be because traditionally most end-users were experts themselves, or, the developer may not be trained in effective user-interface design or may think it unimportant. As a result, the application may have a low usability rating, decrease in popularity or end up highly distressing the user.

Another impact of the popularity of PCs and the Internet is the increased focus on the use of computers in education, including K-12 schooling, Higher Education, and corporate training (such as Vocational Education Training – VET). This focus comes through increased funding, lower computer-student ratios, increased training and usage of Information Communications Technology is schools (ICT) and an increase in fully-online or blended learning in Higher Education and the corporate sector. For instance, in May 2004, the Australian Government contributed $308 million in ICT funding, for research and development (R&D) in the industry, the commercial application of ideas and developing and retaining ICT skills (Dinham, 2004). Also, in 2000 the Australian Government created the Australian Flexible Learning Framework to provide direct funding and support of vocational education practitioners in the area of eLearning. This framework was extended for a year in 2005 by government and state bodies, through a $15 million dollar grant. Their purpose is to extend VET training to cater to more areas in Australia and provide support to registered training organisations of eLearning (AFLF, 2008)

In regards to student-computer ratios, a national study sample of IT skills in primary and secondary Australian schools by the Australian Bureau of Statistics (2000) found that in 1998 most school principals regard Information Technology as important to students' learning, and that the great majority of schools give a high budget priority to the provision of hardware and software for students and for teachers and that overall, there has been a strong focus on providing computers for student use in schools. The study also found that 85% of all school students used a computer outside of school time. A further study by the Australian Bureau of Statistics (2007) found that in 2006/2007 in 2006/2007 73% of households had access to a home computer, and 64% had access to the Internet. Of these, 31% had access to dial-up access, whilst 68% had broadband access. When it came to how households use their computers, most respondents of the study used their computer for personal or private purposes (68%), followed by work or business related purposes (17%), education or study (12%), and other purposes – including community and volunteer work (13%). When it came to the use of computer technology within Higher Education, a study involving university students by Oliver and Towers (2000) showed that 84% per cent of university students have

access to a home PC, 65% cent have access to the Internet at home, and 95% made regular use of Information Communications and Technology (ICT).

1.2.2 Commercial Training Provider

The technological revolution has been mirrored by a significant growth in online learning (eLearning). This includes the delivery of training and education via educational software, particularly the Internet, by registered training organisations (RTOs), vocational educational training organisations (often RTOs or universities), and other educational organisations such as universities. The concept 'educational technology' often seems synonymous with that of 'instructional designer', although in practice instructional design is just one role involved in the production of eLearning material. Richey, Morrison and Foxon (2007) reported that since the 1980s, the majority of instructional design practice has occurred within the private sector, particularly corporate business and industry settings. They note a significant growth within the training sector of eLearning applications has occurred within the United States, and that this growth has been mirrored on a global level across the world, as employees have invested more money on training. Much of this training is aimed at either increasing the productivity of workers or complying with industry standards. Perhaps because of this, the vast majority of corporate training programs that the researcher has come across tend to be developed from an objectivist epistemology and thus utilises a behaviourist learning methodology (more about this methodology will be discussed in the next section of this chapter). In Australia the majority of eLearning applications are aimed at compliance training such as 'Airport Security' or 'Occupational Health and Safety', or business development training such as 'Project Management'. Few eLearning applications within the commercial sector, which the researcher has come across, is aimed at developing higher order thinking skills, which encourage the end-learner to develop more conceptual skills such as 'critical thinking'. This may be because the producers prefer to stick to developing lower order thinking skills, or it may be because some instructional designers are somewhat untrained for promoting higher order thinking skills. This tends to be supported by the findings of Merrill and Wilson (2007) that reported that 95% of all instructional design is done by designers-on assignment – that is, an employee whom is assigned to the task of instructional design but whom is not trained for the job.

The growth of online learning within the Australian training sector has been well advertised within the media. For instance, Eric Wilson (2004) reported that the Australian Flexible Learning Framework – a joint federal and state government initiative, had invested significant amounts of time and money into delivering eLearning training 'toolboxes' for private and public training and educational organisations, from K-12 to adult learning. Over 3000 toolboxes at the time had been sold for teaching, learning, and assessment to various Australian clients including Coles Myer and McDonalds. As reported above, the tasks of

producing eLearning software within the corporate sector tend to be divided quite purposefully into separate tasks and each task tends to be handled by a separate individual. This generally includes the tasks of instructional designer, subject matter expert, web developer, graphic designer, evaluator, and project manager (Richey, Morrison, and Foxon, 2007). The strict division of tasks may be due to the need for companies to manage the cost-effectiveness of developing eLearning material, due to the commercial nature of its delivery. Some industry experts are arguing that the growth of online learning has revolutionised the training industry (Richey, Morrison, and Foxon, 2007). Others however, point out that the Internet only changes the way in which learning materials are accessed, and that it can actually perpetuate traditional learning methodologies such as behaviourism. As, Hannafin and Reiber (1989) point out that "advances in technological capability alone no more improve instruction that sharpened pencils improve prose" (p.102).

1.2.3 Higher Education

Arguably, the technological revolution has had a significant impact upon the delivery of teaching and learning within Higher Education. The Commonwealth Department of Education Science and Training (DEST) commissioned a major study by Bell et al. (2002) between August and December 2001. The aim of this study was to ascertain the extent of online education at Australian universities. They found that from 1994 there has been considerable activity within universities in the use of Internet technologies for teaching, learning and administrative services. Their key findings showed that the use of the Internet in university units ranges from 99-100% of units in seven universities to just 9% in one university. Nevertheless, they found that at the time of their study all universities were employing the web to some extent for teaching and learning. For example, 54% of university units have content available via the web. The survey also found that there were 207 fully-online courses offered by 23 Australian universities at the time, and that 31% (65 courses) were delivered fully-online. Whilst the percentage of fully-online units (no face-to-face component) was relatively low, the study found that a high percentage of web-supplemented (course material available online but optional, such as resources and supplementary reading) and web-dependent (compulsory course material available online) units existed, and this appears to be a clear statement that many institutions are using online technology to add value to teaching and learning.

It should be pointed out that there are several differences between developing training for VET for instance, and developing learning material for Higher Education. The educational background of vocational learners may not extend beyond standard workplace entry levels, whereas the entry level for Higher Education generally extends to at least year 12. The training industry tends to develop material for specific work-related tasks, such as 'handling dangerous equipment on-site' or 'airport security' that does not necessarily require a deep

theoretical background. Also, specific training is generally a requirement for the job and not optional, whereas the pursuit of Higher Education tends to be the choice of the learner. When it comes to the tasks of developing and delivering online learning within Higher Education, Dempsey et al. (2007) report that they generally include the same as those from the training industry. That is, instructional design, subject matter expertise, and development. Nevertheless, what often differs is who performs each task. Within Higher Education instructional designers often perform the dual role of instructional designer and web designer, and may often be forced to undertake the roles of web and graphic developer as well. The researcher has found that in practice, more often than not, the academic (subject matter expertise) has often been forced to perform the multitude of tasks involved in designing, developing and producing online learning, with limited support from their institution. This may be due to a lack of funding, or it may be due to a lack of knowledge on the need for more support of teaching and learning within Higher Education.

The literature on the impact of the technological revolution within Higher Education tends to focus on the belief that the Internet will change the underlying teaching methodology, without necessarily looking at whether this change has occurred. Like Hannafin and Reiber (1989), the researcher believes that the tool that is used for its delivery doesn't necessarily influence innovation in teaching and learning. Furthermore, it is the belief of the researcher that innovation is most likely to occur with the development of research on the courseware design. In particular, the impact of the user-friendly design and constructivist-oriented methodologies upon online learning, according to students themselves. The literature on teaching and learning online tends to be divided into that of user-friendly design, or that of learner-friendly design, and much of the research is focused on the perceptions of professionals and academics as opposed to students. Although the literature tends to argue that a pedagogical shift has occurred from teacher-centered to learner-centered methodologies within Higher Education, the voices of students tend to be silenced, and it is these voices that are essential if one is truly said to be 'learner-centered'. It is unclear what students think of the term 'learner-centered', nor what this term means when it comes to developing learner-friendly online learning. In particular, what effects does the user-friendly design have upon student learning? Furthermore, what do students think about designs based on the 'learner-centered' epistemology of constructivism? These are some of the issues that should be addressed, particularly for online learning material addressed at developing conceptual skills common within Higher Education, if a real 'revolution' can be said to occur.

1.3 Courseware Design

1.3.1 Definition

Courseware has become an important aspect in educational theory and practice. There are a myriad of definitions on courseware. At its most basic level, courseware is synonymous with 'online learning', and 'eLearning modules/units', and refers to part or whole of an academic course which may be available via the Internet. Bell et al. (2002) provide a comprehensive overview of the three categories of courseware that are available, this includes web supplemented, web dependent, and fully-online units. Within web supplemented units online participation is optional, and the "information is used to supplement traditional forms of delivery" (p.13). This may include course descriptions, study guides, and reading lists for example. Within web dependent units online participation is compulsory, although a level of face-to-face teaching is maintained. According to Bell et al., the three types of web dependent activities may include using the web to interact with content (web content dependent), using the web to communicate with peers or instructors (web communication dependent), or using the web to interact with the content and communicate with peers or instructors (web maximum dependent). Finally, fully-online units refer to courseware in which all learning activities and material are delivered online, without a compulsory face-to-face component. This research appropriates Bell et al.'s definition of courseware, into the following:

> *Courseware is a course (academic unit) that is delivered utilising educational media, and generally requires access to the web. It is designed to encourage learning, and may contain learning content, activities, resources, the ability to interact with instructor(s) and student(s), and/or links to support services integrated with the courseware provider.*

Arguably, this definition of courseware differs to Bell et al., by providing somewhat greater flexibility for interpretation. For example, a standard courseware may contain content, learning activities, assessment, the ability to communicate with instructor(s) and/or student(s) and/or a link to support services. Under the expanded definition, courseware may include a course that is delivered utilising a CD-Rom, but still requires connection to the Internet. It may be non-facilitated with all interaction being between the user and computer, or it may be encourage peer/instructor interaction. Students may meet their facilitator or fellow students on an occasional face-to-face basis, or learning may be entirely via educational media. The central focus however, is that enabling effective learning is the purpose behind the delivery of courseware. It is relevant to point out here that most definitions of courseware tend to focus on the researcher or professional's definition, as opposed to students' perception of courseware. If a learner-centered shift is truly said to have occurred however, then the definition of courseware should assumedly include input by students themselves.

1.3.2 User-Friendly Design

The design of courseware has become an increasingly important issue within the literature and practice of eLearning. The principles of 'user-friendly' design and 'learner-friendly design' both need to be applied for effective learning. Much of the pedagogically oriented literature on eLearning however tends to focus on learner-friendly design. Traditionally, the goal of user-friendly design is to make websites 'easy-to-use', with the intended outcome being increased web traffic, online sales, and productivity. As such, the development of user-friendly design is generally 'user-centric', and revolves around the needs and limitations of the end-user. Within courseware however, learning should be the focus of design, and the user-friendly design should be 'learner-centered'. According to Zaharias and Poulymenakou (2006b), this means designing software "that makes people want to learn and know how to learn, beyond the computer task at hand" (p.88). There is a strong literature base on the role and features of user-friendly design, as they apply to general website design (Nielson and Loranger, 2006; McCracken and Wolfe, 2004). The problem with general user-friendly design however is that it doesn't take into account a context where learning is the intended outcome. Researchers point out that this tends to be problematic within the literature and practice of courseware design, partly because there appears to be a lack of collaboration between experts within user-friendly and educational design (Squires, 1999; Zaharias, 2004).

There is a growing literature base, which supports the needs for eLearning to take into account both learning theory and usability (Myhill, Le, and Le, 1999; Zaharias, 2004; Zaharias and Poulymenakou, 2006a; Danielson, Lockee, and Burton, 2000). Furthermore, general web-usability experts, such as Nielson and Loranger (2006), point out that specific usability design and evaluation should occur for specific/niche area websites. There is a growing literature base on design guidelines for eLearning (see Clark and Mayer, 2003). Nevertheless, these guidelines tend to be expert-centered, and it is somewhat unclear what learners' perceptions are of user-friendly design, particularly when it comes to how user-friendly design impacts upon their learning experience. Some researchers imply that applying generic user-friendly guidelines can significantly aid learning. For instance, Danielson et al. (2000) comment:

> "the HCI field has its own experts and literature base; it is not necessary for all instructional designers to develop yet another expertise. Simply knowing basic interface design concepts will go far in the creation of effective Web-based instruction and the facilitation of learning in this electronic environment" (p.127).

The concern here however, is that researchers are not sure about which design guidelines impact upon learning. As a result, courseware may be user-friendly, but on the other hand it may not be learner-friendly (Myhill, Le and Le, 1999). Myhill, Le and Le (1999) note that the term user-friendly aims at moving software development away from the software to its users,

so that users are the primary source of design inspiration. They recognise that a potential problem with utilising this perspective for the design of educational software, is that whilst the design may make users 'happy ', it may actually be educationally 'unfriendly'. Zaharias and Poulymenakou (2006b) point out the challenge for most e-learning designers are that an established set of heuristics do not exist. They emphasise that many guidelines are not adequately adapted for web-based learning environments. Furthermore, they believe that the perspectives of learners' tend to be silenced, as much of the research focused on developing eLearning heuristics and evaluation methods that reflect the views of experts. Thus there is also an ellipsis on the impact of user-friendly design, which addresses the 'user' as a 'learner' (Zaharias, 2006).

1.3.3 Learner-Friendly Design

User-friendly and learner-friendly design has traditionally been considered as mutually exclusive concepts, but both are important in creating learner-centered courseware. For example, Myhill, Le and Le (1999) describe the development of a TESOL courseware for Higher Education students. They note "Two courseware design perspectives are considered in constructing this web-based courseware: the first perspective we shall refer to as the educational perspective; and the second as the human interface design perspective. These perspectives are mutually inclusive in any courseware development" (www, para 4.). Myhill, Le and Le introduce the term 'learner-friendly', to emphasise the significance of having an educational perspective to educational software development. They state that this term is user-friendly's counterpart, but it is not necessarily its conceptual opposite. They imply that user-friendly design may impact upon the pedagogical design of courseware, and that the pedagogical design of courseware may impact upon the user-friendly design. Bell et al. (2002) found that one of the key issues requiring further research in online learning concerns the pedagogy. Their central concern is whether the teaching mode for Higher Education should shift from a teacher-centered methodology, to a learner-centered methodology. For instance, they question whether the teaching model in Higher Education should shift from teacher-centered traditional didactic methods where the lecturer is the 'sage on the stage', to a more 'learner-centered' discovery-based methodology through technology, where lecturers become the facilitator and the 'guide on the side'.

The concept "learner-friendly" and its related educational principles are still debated by researchers in courseware development. In particular, there is debate on the move from behaviourist methodologies that stem from objectivist epistemologies and inspire teacher-centered instruction, towards constructivist methodologies, which stem from constructivist epistemologies and inspire learner-centered instruction. Academics in eLearning argue that a behaviourist methodology that provides direct instruction to learners tends to be best for well-structured problems, which does not require multiple answers or problem-solving. On the

other hand, they also argue that this methodology tends to encourage route learning and memorization, and is not suitable for ill-structured problem types – which this research focuses on. Instead, researchers argue that courseware designed using a constructivist philosophy is most appropriate here. That is, designing around the belief that learners actively construct their own meaning. In this vein knowledge cannot be transferred, it must be actively constructed by the learner based on their existing mental models. Jonassen, Cernusca, and Ionas (2007) argues that there has been a shift towards learner-centered constructivist methodologies within the literature and practice of online learning, and that constructivism has significantly impacted upon the pedagogical design of educational technology, Nevertheless, there still continues to be debate about whether constructivist-oriented approaches are viable (Hannafin and Hill, 2007). For instance, in contrast to Jonassen, Cernusca, and Ionas (2007), Merrill et al.,(1996) argues for a teacher-centered approach to the design of courseware, which is rooted in the behavioural sciences. From the recent proliferation of learner-centered research oriented towards a constructivist perspective, it may appear that the issue of behaviourism versus constructivism has been solved. Nevertheless, there is a gap in the literature on learners' perspectives of constructivist-oriented designs. Furthermore, it is still unclear how a fully-online courseware developed from a user-friendly and constructivist-oriented perspective could be designed for Higher Education, and how learners' may evaluate this compared to academics and professionals.

The two major learning theories, behaviourism and constructivism, have influenced the instructional design of educational technology. Both models of instruction produced from these theories are useful, though in different contexts (Jonassen, 1994, p.37; Sevilla & Wells, 2001). Skinner's studies on behaviourism directly influenced instructional design, to create a teacher-centred approach that has dominated instructional design since the 1960s (Lefoe, 1998; Sevilla & Wells, 2001). Behaviourist instruction adheres to an objectivist epistemology that considers knowledge as being single dimensional, and fixed. It develops of a set of instructional sequences, with predetermined outcomes (Lefoe, 1988), consisting of a series of interfaces, generally ending in a multiple-choice quiz that tests memory, with feedback from the original content material for 'remediation' (Sevilla & Wells). The problem with this approach however, is that it is considered ineffective for problem-based solving, which requires innovative learning, and 'ill-defined' problems. For this, theorists recommend constructivism (Sevilla & Wells, 2001; Jonassen, 1997; Jonassen, 1999b). In contrast to this, constructivism has a learner-centred approach to learning (Perkins, 1991). It focuses on the learner as an active participant in the learning process, whereby learners are encouraged to set their own objectives, and pace their own learning. As Roger Schank (1993) points out, good educational software is active. This is students ought to be doing something, not watching something. Whilst there are several schools of constructivism, for example,

personal, social, information processing, and communal, the central tenet of all constructivist theories is that knowledge is actively constructed by learners, rather than directly transmitted from the teacher. Constructivists also believe that as a result, there will be multiple perspectives and realities, learning should be embedded in a 'real-world' environment that emphasises 'real-world' complexity and multiple solution paths, and that the role of teacher should move to that of facilitator and mentor rather than dictator.

As Bell et al.'s (2002) survey implies there still is a gap in the literature regarding learner-centered constructivist-oriented designs. Will learners accept responsibility for their own learning? Should instructional designers cater to learners who need more direct instruction than an authentic constructivist-learning environment may provide? What should the role be of direct instructional strategies in contemporary courseware? Is there any pedagogical advantage in maintaining elements of behaviourist instruction? David Jonassen created the Instructional Design model, constructivist-learning environment (CLE), based on elements of constructivist theory. This model emphasises building learning environments that fosters, rather than controls problem-solving. As Jonassen (1994a) notes, "Constructivists emphasize the design of learning environments rather than instructional sequences […] They do not seek to predetermine a sequence of instruction or a prescribed set of activities and thought processes by the learner. Rather, they seek to provide a supportive environment in which the learner can interpret at least a simulated reality in order to better understand that reality" (p.35). The strength of this model is that it provides an excellent base from which to start designing constructivist-based courseware and it utilises multiple constructivist philosophies. Although there have been numerous designs based on the theory of CLEs in Higher Education, most of these designs are oriented towards specific case-based activities, as opposed to the design of fully-online courseware. Furthermore, although the theory is said to be learner-centered, in practice is unclear what learners think about courseware designed influenced by CLE theory compared to academics and professionals.

13.4 Moving Towards a New Design Model

Historically, new technologies have had a profound influence on the content and delivery of education, as well as teaching strategies. Bell et al. (2002) note, "the much-talked about pedagogical benefits of the new forms of delivery and interaction lead some commentators to suggest that the shift to online teaching and learning may be heralding an entirely new pedagogical approach in Higher Education" (p.29). As discussed earlier in this chapter however, it should be emphasised that the technology is an enabler for learning – just as pen is to paper, and that the real innovation must occur with the epistemological design of courseware. It is also relevant to point out however, that this shift from teacher-centered to learner-centered approaches is still occurring, and that it was still less than a decade ago that Reigeluth (1999b) pointed out that the current paradigm of education was one based on

teacher-centered approach to learning that encouraged a passive approach to learning, and that this needed to move towards a student-centered approach to learning which encourages a more active approach to learning. Almost a decade later, the literature still tends to refer to learner-centered approaches as somewhat 'new', and academics are still navigating the path from teacher-centered to learner-centered approaches to teaching and learning online. There still seems to be some level of confusion and disagreement on the basic pedagogical principles behind courseware design. As Hannafin and Hill (2007) point out the "debate over the elusive 'best' approach has been lively and occasionally rancorous" (p.59). Interestingly, Hannafin and Hall believe that both behaviourist and constructivist perspectives can be considered within courseware, "*if* they employ methods than are consistent with the underlying epistemological frame" (p.59). Other academics (see Rieber, 1993; Winn, 1997; and Young, 1993) agree that both behaviourist and constructivist perspectives can be utilised as complementary 'toolkits'. Nevertheless, the debate tends to be self-reflexive, with academics each referring to each-others work, and the perspectives of learners tend to be left out.

1.4 Research Objectives

The five objectives of this research are as follows:

Objective 1:

To investigate the attitudes and views of university students, academics, and professionals on courseware design as part of teaching and learning online in contemporary Higher Education. In particular:

(a) How do contemporary students, academics and professionals define courseware?

(b) What are some of the strengths, requirements and concerns on teaching and learning online?

(c) Does participants' backgrounds significantly affect their perspectives on teaching and learning online?

Objective 2

To examine the significance of user-friendly design for effective courseware design within Higher Education, and investigate the attitudes and views of university students, academics, and professionals on the features of user-friendly design. In particular:

(a) How important is screen design and layout, navigation design, and usability design for effective teaching and learning online?

(b) What are some of the requirements and concerns on user-friendly courseware design?

(c) Does participants' backgrounds significantly affect their perspectives on user-friendly courseware design?

Objective 3

To examine the concept 'learner-friendly' design and its relevance to effective courseware design within Higher Education, and investigate the attitudes and views of university students, academics, and professionals on the features of learner-friendly design. In particular:

(a) Should learners be consulted in designing courseware? Should courseware be designed to accommodate different learning styles?

(b) Do participants believe courseware should be based on educational philosophies? Do participants value specific features of courseware, i.e. enabling independent learning, designing for flexible learning, providing learning resources, and self-tests for learners?

(c) What are some of the requirements and concerns on learner-friendly courseware design?

(d) Does participants' background significantly affect their perspectives on learner-friendly courseware design?

Objective 4

To critically examine the role of behaviourist and constructivist philosophies in contemporary courseware design for Higher Education, and investigate the attitudes and views of university students, academics, and professionals on designs based on these philosophies. In particular:

(a) What are students', academics', and professionals' attitudes in regards to design features on direct instructional guidance, open-ended environments, recall and memorisation, course objectives, real world learning for Higher Order Thinking, multiple-choice activities, and collaborative learning?

(b) What are some of the requirements and concerns on designs based on behaviourist and constructivist-oriented philosophies?

(c) Does a participants' background significantly affect their perspectives on designs based on behaviourist and constructivist philosophies?

(d) Could the two philosophical concepts be amalgamated within courseware design to act as 'complementary toolkits'?

Objective 5

To construct an undergraduate fully-online courseware prototype for a first year university course based on the example topic Intercultural Communication. Design and document the prototype to reflect the current literature and practices on effective user-friendly and learner-friendly design, design a user-friendly courseware based predominately on constructivist philosophies. Invite students, academics, and professionals to evaluate the courseware, and

present a range of perspectives on the user-friendly and learner-friendly design. The focus is specifically on:

(a) What are participants' attitudes to the user-friendly and learner-friendly design of the prototype courseware evaluated in this study?

(b) Does the theory and practice on courseware design translate effectively into practice, when it comes to the courseware evaluated in this study?

1.5 Research Methodology

This research utilises a mixed-methods approach to the research methodology, by collecting both quantitative and qualitative data collection, and analysing the results to provide different insights into courseware design within Higher Education. The quantitative data included numerical questionnaire data, surrounding teaching and learning online, user-friendly courseware design, learner-friendly courseware design, and its subset of behaviourist and constructivist-oriented design. The qualitative data included the open-ended questionnaire data (including two questions which provide participants with the opportunity to state their perceived strengths/requirements and weaknesses of courseware), and the summative evaluation of a courseware prototype developed specifically for this study. Students and academics from Education and Other Disciplines, professional instructional designers, and web developers were invited to participate in the study. Most of the students and academics came from the University of Tasmania (UTAS), whereas most of the professionals came from registered training providers (RTOs) in Melbourne, Victoria.

The researcher emailed potential academic and professional participants to invite them to discuss the study. The researcher met those whom were interested in the study, and invited them to participate in the questionnaire and interview. The researcher also asked academics for the opportunity to invite their students to participate in the study, and invited students to participate in person, if the academic responded positively. There were 246 participants whom responded to the questionnaire. These participants were also invited to evaluate the design of a fully-online courseware prototype, constructed along a user-friendly constructivist-oriented methodology, in order for the study to obtain some contemporary perspectives surrounding this design methodology. Ten students, academics, and professionals evaluated the courseware via a face-to-face interview with the researcher. Another group of courseware evaluators included web-based participants, whom were invited to evaluate the courseware's user-friendly and learner-friendly design virtually, via various specialised listservs (IFETS, ITFORUM, TAS-IT, and UTAS_education). Seven virtual participants responded to this call, and emailed the researcher their interpretations of the courseware's design strengths and weaknesses. The results of the quantitative and qualitative data were put together, to provide a range of insights into some contemporary

academics, students, and experts opinions surrounding courseware design particularly within Higher Education.

1.6 Significance of the Research

The effect, implementation and features of online learning is currently a primary focus for teachers, learners and persons involved in Australian schools, Higher Education, and public organisations, as well as private registered training organisations and corporate organisations.

- This research is significant because it involves the design, development and evaluation of a fully-online user-friendly courseware based on constructivist-oriented principles.
- It will hopefully provide a better understanding of how a select group of contemporary research participants define and perceive courseware, and what some of their requirements and concerns are on teaching and learning online.
- It is expected that this research will provide a better understanding of the importance of user-friendly design to teaching and learning online and how user-friendly design impacts upon learning. In particular, some of the requirements and concerns of user-friendly courseware design, according to a range of contemporary participants.
- It is expected that this research will provide a better understanding of how important the learner-friendly design to teaching and learning online is, and more feedback on some of the requirements and concerns of learner-friendly design. In particular, what are the perspectives on behaviourist and constructivist-oriented designs, according to a range of contemporary participants?
- This research is also significant because it will hopefully provide data on whether students' perspectives on courseware design differ to academics and professionals, and whether participants' backgrounds significantly affect their perception of some specific features courseware design.

All in all, it is expected that the study will give some insights into the theoretical aspects of on-line teaching and learning with a focus on constructivism and will provide useful practical insights for courseware design, development and evaluation of a prototype fully-online courseware for Intercultural Communications. The research data will potentially contribute to our understanding of how learners learn online, and what motivates them in an online environment. Potentially, it will contribute towards best practices in online learning and training, enhance future courseware development and positively affect curriculum reform in the area of eLearning.

1.7 Limitations of the Research

The following limitations of the research apply:

- This study does not focus in-depth on the issue of online versus face-to-face learning, such as whether online learning is more effective than face-to-face learning in terms of cost-effectiveness, time-effectiveness or learning-effectiveness. The focus of the study is on online learning, so any direct questions relating to this study tend to revolve around the issues of face-to-face as they affect students online. For instance, is synchronous chat technology an effective alternative to face-to-face learning? It is anticipated however, that the responses from the open-ended questions relating to this study may provide feedback on the related issues of online versus face-to-face learning, nevertheless this study should not be used to justify whether online learning is more effective than face-to-face learning.
- This study involves the design of an example prototype courseware for a first year university course on Intercultural Communication. The focus is on the design of the courseware, which is based on user-friendly and constructivist-oriented principles. Ongoing informal evaluation of the courseware's user-friendly design was performed throughout its development, and it is the assumption of the researcher that the prototype is therefore user-friendly. The design of the learning environment revolved around ill-structured problem types, as they are more common amongst university studies, as opposed to well-structured problem types that are more common amongst the training industry. It should be pointed out that some of the associated limitations of this courseware are that the focus is on the design approach as opposed to the subject matter expertise. Thus, this research is not an in-depth study of subject Intercultural Communication. Also, whilst the researcher assumes the courseware is user-friendly, the intention is not to provide a professionally designed courseware that would be ready for commercial sale. Thus, the courseware is a prototype oriented towards Higher Education, and it is not assumed that it would be developed and saleable any time in the future as a commercial venture. Finally, since the design is focused on ill-structured problem types – that is, those with multiple answers, the courseware design and evaluation should not be used to justify the design and evaluation of well-structured problem types – that is, those with limited answers.
- This study examines how the aspects of screen design and layout, navigation, and usability in courseware, impacts upon online learning. An outcome of the study's open-ended questions on user-friendly design may show how other aspects of the user-friendly design impact upon student learning. It should be pointed out however, that the intention of the researcher is not to provide a comprehensive guide to heuristics for courseware design, rather to look at how aspects of user-friendly design may potentially strengthen or weaken the potential for learning to occur online.

- The interpretation of the constructivist epistemology into a design methodology is based on the researcher's reading of the literature, and her practical experience as an instructional designer. It should be pointed out however, that the researcher's interpretation is labelled as 'constructivist-oriented', as her perception of how a constructivist epistemology may be utilised, may differ from others' interpretations.
- Finally, the majority of students and academics participating in this study came from the University of Tasmania, and the majority of professionals participating in this study came from professional training organisations from Melbourne, Victoria. Thus, this study should not be used to generalise the perceptions of students, academics, and professionals across the broad spectrum of Australia, rather a quite select participant group.

1.8 Ethics

This research utilised a mixed-methodologies approach to its research design, which involved the collection of both quantitative (numerical) and qualitative (open-ended) data. This included the collection of data via questionnaire (which included numerical and open-ended components), and the open-ended evaluation of the courseware. Students and academics, mainly from the University of Tasmania, were invited to participate in the study. (The word "mainly" is used here as a limited number of students and staff from other Australian universities also participated in the study). The researcher approached academic staff from the Faculty of Education and Other Disciplines by email to invite them and their students to participate in the study. The researcher met interested staff members personally to discuss the possibility for the researcher to invite their students to participate in the study. If the academics were interested, then the researcher met students, and they were then given information sheets on the questionnaire and courseware evaluation. Many academics and students completed the questionnaire at the time of meeting the researcher, however others were given pre-paid envelopes to post the questionnaires back to the researcher at their own convenience. Those interested in undertaking the courseware evaluation contacted the researcher when first introduced to her, or later by email. A relatively small group of professionals from registered training organisations, from Melbourne Victoria, were also invited to participate in this study. These participants were invited by email to participate in the study, and if interested they were sent the information sheets on the questionnaire and courseware evaluation as well as the questionnaire by post. A pre-paid envelope was also sent, for those interested in returning the questionnaire. A final group of both local and international participants were invited to evaluate the courseware only, via email to a select group of list services (TAS_IT, IFETS, ITFORUM) oriented towards instructional design for online learning in Higher Education. A hyperlink and brief explanation of the courseware was sent in the email. Those interested in providing feedback on the user-friendly or learner-friendly design of the courseware contacted the researcher by email or online feedback form.

The face-to-face research participants could undertake the open-ended interview (courseware evaluation) without having completed the questionnaire. Likewise, the online research participants could provide open-ended feedback on the courseware evaluation, without having completed the questionnaire. It should be pointed out that the information collected in the questionnaire was de-identifiable and participation in this study was entirely voluntary. Participants could withdraw from the study at any time without any effect. Participants were informed that confidentiality and anonymity of their participation in the interview was to be maintained, as was the privacy of the information divulged during the interview session. Also, all interviews were to be audio taped, coded and transcribed. Copies of the audio and/or transcription of the interview could be supplied to the participants upon request. Once the study is completed, the audiotapes and transcripts are to be stored in a secure locked cabinet at the University of Tasmania for a period of 5 years after which they will be destroyed (erased/shredded). The school and interviewees will not be identified by name and extra care will be given to the way the schools' profile is recorded in the data so that its identity cannot be definitively ascertained from the information in the data. This study received the approval of the Human Research Ethics Committee (Tasmania) Network, and participants were informed that if they have any concerns or complaints of an ethical nature or complaints about the manner in which the project has been conducted, to contact the Executive Officer, Mrs. Amanda McAully (03 62262763). They were also notified that they could obtain a copy of the summary of the study's results and subsequent analysis. More information about the research methodology will be provided in Chapter Three.

1.9 Overview of Thesis

Chapter One: Introduction

This chapter has introduced the researcher's journey to and throughout this research. It has provided an overview of teaching and learning online, and discussed the growth of online learning within both the areas of commercial training and Higher Education. A definition of courseware was provided, as well as an overview of the issues on user-friendly and learner-friendly courseware design. The objectives of this research were discussed, in particular the investigation of the user-friendly and learner-friendly design and evaluation of contemporary courseware. The significance of this research was discussed, as were some of the limitations of this research. A brief overview of some of the ethical issues on this research was also provided.

Chapter Two: Literature Review

This chapter provides an overview to the area of teaching and learning online. It looks at how computers now dominate the sphere of Education, and how students and academics are now reliant upon computers in Higher Education. The chapter discusses the complexities associated with designing courseware, and it looks at the some of the issues on the move from teacher-centered to learner-centered methodologies within the literature and practice of

courseware design. In particular, it investigates in depth the areas of user-friendly and learner-friendly courseware design, and looks at where the gaps in the research lie. For instance, the need for a greater level of understanding in regards to the way user-friendly design impacts upon online learning, the need for a greater level of understanding in regards to the design and impact of constructivist-oriented methodologies, and the need for learners' voices to be heard when it comes to designing learner-centered courseware. The chapter then looks at how this research may address some of the gaps in the literature, which have been discussed.

Chapter Three: Methodology

This chapter introduces the mixed methods research methodology utilised by the researcher in this study. It provides an overview to the importance of having research aims and objectives, before discussing the importance of the research problem. The objectives on this study are then reaffirmed. Some of the assumptions made by the researcher are discussed, as well as the research design' limitations. The development and delivery of the prototype courseware evaluated in this research study is discussed, before the researcher provides further discussion of the mixed-methods research design. Since this courseware involves the design, development, and evaluation of a prototype courseware, this chapter introduces the software engineering lifecycle. The quantitative approach to this study is then discussed, in particular the methodology and design on the questionnaire's numerical component (Part A and Part B). The qualitative approach to this study is then discussed, in particular the methodology and design on the questionnaire's open-ended questions (Part C), and the courseware evaluation (interviews and email data). Finally, some of the ethical issues on the research methodology are broached.

Chapter Four: Courseware Design

This chapter is divided into three main parts. The first part of this chapter looks at some of the theoretical issues on courseware design are discussed, in particular, the design guidelines on the development of learner-centered courseware. Specific attention is paid to the user-friendly design guidelines, and the learner-friendly design guidelines within the literature on courseware design. The second part of this chapter looks at the design of the prototype courseware utilised in this study. The discussion of the user-friendly design looks at some of the technical constraints, minimum computer skills and accessibility, ergonomics, harmonious screen design, and the help features and navigational aids in the courseware prototype's design. The discussion of the learner-friendly design looks at the blended learning option, individualisation, flexibility, educational games, and constructivist features in the courseware prototype's design. The final part of this chapter provides an overview of the physical aspects of the courseware prototype, through screen captures. It covers the introductory pages, login page, first time tutorial pages, homepage, navigational and learning aids, learner and instructor screens, course information screens, activities screen, communicate screen, and resources screen.

Chapter Five: Quantitative Analysis

This chapter introduces the quantitative analysis utilised in this research, before reaffirming the objectives that are relevant to this section. Some of the tools and techniques of the quantitative analysis are discussed, in particular the division of the questionnaire's numerical data into sub-themes on teaching and learning online, user-friendly design and learner-friendly design, and the use of SPSS statistical software to perform a specific range of data analysis. That is, an investigation of the Means, analysis of ANOVA, and the Tukey post-hoc test. An overview of the research's participant sample is provided, in particular the participants' age, occupation, gender, institution, familiarity with teaching and learning online, and computer literacy. The data analysis is then provided, according to the themes of teaching and learning online, user-friendly design, learner-friendly design, and behaviourist and constructivist-oriented designs (these are a subset of learner-friendly design). Following this, a discussion of the findings is presented, again divided into the themes of teaching and learning online, user-friendly design, learner-friendly design, and behaviourist and constructivist-oriented designs. The conclusion of the chapter provides an overview of the main findings.

Chapter Six: Qualitative Analysis

This chapter introduces some of the theoretical aspects behind the qualitative analysis, in particular the Grounded Research Methodology that was used by the researcher. The design of the open-ended component of the questionnaire was discussed, as was courseware evaluation. Specific attention was paid to the general open-ended questions that participants were asked. The chapter looks at how the qualitative analysis may provide insights into the perspectives behind the quantitative findings, or emerging insights that have not yet been covered within the research. The results of the open-ended questionnaire were covered. These were divided into the strengths, requirements and concerns on teaching and learning online, the requirements and concerns on user-friendly design, the requirements on learner-friendly design, and some of the divergent perspectives on the learner-friendly design. The qualitative analysis of the courseware design looked at participants' definition of courseware, the evaluation of the user-friendly design (looking at the sub-themes of screen design and layout, aesthetics, navigation, collaborative tools, usability aids, learning aids, and evaluation), and the evaluation of the learner-friendly design (looking at the sub-themes of instructional guidance, independent learning, deep learning, and other aspects of the courseware design). A discussion of the qualitative findings is then presented, focusing specifically on the objectives as they apply to the aspects of teaching and learning online, user-friendly design, and learner-friendly design, A brief summary of the main findings is provided in the conclusion of the chapter.

Chapter Seven: Conclusion

This chapter looks at the importance of conducting research, and it provides an overview of the research journey at its conclusion. Once again, it revisits some of the aims of this research, in particular the investigation of user-friendly and learner-friendly courseware design. An overview of the research methodology is provided, as well as a discussion of some of the limitations of this research as they occurred to the research at the end of the research journey. The main findings from the quantitative and qualitative analysis are presented, and both findings are bought together to provide a range of perspectives on teaching and learning online, and user-friendly and learner-friendly courseware design. Finally, the researcher's thoughts on the findings are presented, including how the research objectives were addressed, a discussion of the overall findings, any emerging issues which were found, any weaknesses with the research, and finally the researcher looks at the future of this research where suggestions are made for further research.

Chapter 2: Literature Review

2.1 Overview

The previous chapter provided an introduction to this research. It provided an overview of the technological revolution occurring worldwide, and it introduced us to the area of teaching and learning online. In particular, the introduction provided a very brief overview of some of the issues on the user-friendly and learner-friendly design of courseware. This chapter will discuss the literature and issues on this research in more depth. A discussion of courseware design in Higher Education will be presented, followed by a discussion of the importance of user-friendly and learner-friendly courseware design, and an overview of some contemporary learning management systems that are used to deliver courseware. The learner-centered design paradigm will be introduced, and a discussion of teacher-centered and learner-centered methodologies will be presented, followed by the issues on the paradigm shift from teacher-centered to learner-centered designs. The user-friendly design of courseware will then be discussed in-depth, including a definition of user-friendly design, an introduction to some heuristics on user-friendly design for general web site development, and a discussion of the issues on the impact of designing user-friendly courseware for learning. Following on from this, will be a conversation on the learner-friendly design of courseware. A definition of learner-friendly design will be provided, including how learner-friendly design of courseware

differs from user-friendly design, and why learner-friendly design is important to the development of courseware. We will then be introduced to the area of instructional design, and the issues on how the technological revolution has, and has not yet had, to understanding what instructional designers do. A general discussion of the developing heuristics for instructional design of courseware will be provided, followed by an introduction of the two epistemologies – behaviourism and constructivism, which are dominating the design of courseware. An in-depth discussion of behaviourist and constructivist epistemologies follows this, including a discussion of the design methodologies that have stemmed from these epistemologies. Particular attention will be paid to the design of constructivist learning environments, and the gap in the literature on the design of fully-online courseware based on theories on constructivist-oriented courseware. Finally, for courseware to be truly learner-centered it must include evaluation from learners. Thus, the literature on the evaluation of courseware will be presented, followed by the chapter's conclusion.

2.2 Courseware Design

2.2.1 Courseware in Higher Education

Academics worldwide are acknowledging that technology is impacting the way in which education is delivered (Trinidad, 2003; Quinton, 2003). Le and Le (2007a) point out that computers "have become powerful tools and important resources in education" (p.41). Dramatic and rapid changes in technology have meant that the educational environment we are working in is constantly evolving (Lockwood, 2004). Educators have had to adapt quickly to these changes in technology, however confusion regarding how to implement the technology in classrooms, and how to best use the technology for learning is common. Sue Trinidad (2003) points out that whilst "many educational institutions move into the 'technology-rich' arena, educators have found it difficult to follow and use such environments to their advantage" (p.97). Le and Le (2007b) also point out that whilst computer technology has permeated the field of education, it has "created a big challenge to traditional teaching" (p.115). The World Wide Web (www) has significantly impacted the field of education, particularly within the past decade. The www was developed in 1989 as the 'brainchild' of Tim Berners-Lee at the European Organization for Nuclear Research (CERN) to help scientists share their knowledge with each other (Mayhew, 2003). Every day people within business organisations, educational institutions, and personal home settings, now use it to share knowledge with each other.

The World Wide Web is essentially a collection of hyperlinked documents and applications stored on web servers, which are available through software applications called browsers. Web browsers provide a range of in-built tools for navigating and viewing sites on the www. Web pages may include text, graphics, or other multimedia (Mayhew, 2003). Within the field

of education, the World Wide Web has become an important reference tool for downloading course-related material via courseware. Within Australia, every Higher Education institution is now reliant upon the use of the www, and students use the www in a variety of ways for the learning. As discussed in Chapter One, Bell et al's (2002) survey of the use of courseware in Higher Education included a definition of the types of online units available. They point out that these virtual units may be used as a supplementary resource for face-to-face materials, or learners' may be dependent upon courseware in order to complete their coursework. This may involve accessing course material, interacting with the courseware via online activities, or collaborating with other learners or the course instructor for example. The area of courseware design has therefore becoming important in the sphere of teaching and learning online, within Higher Education. As She and Fisher (2003) point out, "Web-based e-learning technologies offer promise and potential for the delivery of enhanced learning in any topic to as many students as possible without limitation, of time, place, and language" (p.344). They also point out however that the "key is to design a web-base e-learning environment that is suitable for the appropriate level of the students" (p.344). Since the use of courseware in Higher Education has only become common in the past decade, there is still a long way to go before academics' fully understand how to design learner-centered courseware. That is, courseware and other learning products that are directed at the learning needs of the students themselves.

A major problem with the design of courseware from a student's perspective, is that there is still debate on what it means to be learner-centered. Much of the literature on learner-centered courseware tends to agree that learner-centered courseware is based on a constructivist epistemology (Neo and Neo, 2002; Burns and De Silva Joyce, 2000). Much of the contemporary academic literature focuses on the move from traditional 'teacher-centered' behaviourist-oriented approach to design, to the emerging 'learner-centered' constructivist-oriented approach to design. Jonassen, Cernusca, and Ionas (2007) point out that the epistemology of constructivism has had a profound influence on the literature and practices on courseware design. Nevertheless, there is still some level of debate on whether this epistemology really helps in enabling learning, and some academics are critical of constructivist approaches to courseware design (Merrill et al, 1996). Furthermore, the majority of courseware that is developed still tends to be designed along traditional behaviourist-influenced principles, regardless of whether it is informed by constructivist principles. Some academics go as far as pointing out that both behaviourist and constructivist epistemologies should inform the design of courseware (Baylor and Kitsantas, 2005; Merrill 2007a).

Another problem with the design of courseware from students' perspective is that there is a significant gap in the literature on what students themselves think of designs oriented

towards learner-centered courseware design. Diana Laurillard (1993, 2002) points out that there is a significant gap in the literature on the perspectives of students, on the design of educational technology within Higher Education. Part of the problem is that the design and development of a fully-online courseware aimed at university students, and oriented towards a learner-centered perspective, is still to be documented within the research literature, and evaluated in-depth by learners, and not just academics or professionals. Whilst the potential benefits of learning via the web has been well-documented particularly by commercial providers of online education, there is still a gap in the literature on the potential weaknesses of learning via the web. Le and Le (2001b) presented their results of a qualitative study of university students' attitudes towards the web in Education. They found that whilst students viewed the strengths of the web as a powerful resource, they also found that there were many negative perceptions of the web in Education. For instance, students found the web to be superficial, imperialistic, impersonal, socially destructive, and commercially driven. Le and Le point out that students' perceptions' of the web in Education should be taken seriously, however the researcher has come across few studies within the literature, which document the perceptions of students' when it comes to courseware design in Higher Education. Perhaps because of the general lack of research on students' perspectives of courseware design, researchers' around the world have documented high levels of drop-out amongst online learners. Tyler-Smith (2006) reports that although the issue of dropout in eLearning needs further research, one of the ways in which dropout may be affected are the cognitive overload of students particularly within the first few weeks of study. Tyler-Smith found that students were somewhat overwhelmed with negotiating the technology, becoming e-Learners, as well as negotiating the content itself. Thus, it is the belief of this researcher that further research on the design, development and evaluation of courseware from students' perspectives, may help researchers' better understand how to positively influence course attrition levels.

2.2.1 User-Friendly and Learner-Friendly Design

Effective courseware design should utilise both user-friendly and learner-friendly courseware design (Myhill, Le and Le, 1999). Interestingly, the literature on courseware design tends to centre upon either the 'user-friendly' design, or the 'learner-friendly' design. There is a significant gap in the literature on approaches that integrate both user-friendly and learner-friendly design. When it comes to the user-friendly design of courseware, Panagiotis Zaharias (2006a) points out that there is an ellipsis in the research on the 'user' as 'learner'. Whilst the user-friendly heuristics for general software development are generally established, there is still a gap in the literature on the user-friendly heuristics as they apply to courseware design. It is still somewhat unclear how the context of learning impacts the user-friendly design of courseware. Furthermore, whilst software may be 'user-friendly', it may be educationally 'unfriendly'. For example, some software may be aimed more towards

gratifying learners' visual and emotional senses, as opposed to focusing on student learning. Arguably, there is a proliferation of commercially-oriented courseware aimed at 'pleasing' the end-client through superficial techniques such as aesthetically pleasing screen design, as opposed to also addressing the pedagogical needs of learners. This emphasises the need to incorporate the pedagogical needs of learners through the 'learner-friendly' design of courseware. Myhill, Le and Le (1999) coined the term 'learner-friendly' and introduced it as 'user-friendly' design's counterpart. They point out that the introduction of this term means having an educational perspective in the evaluation of courseware design. They also point out however, that the interpretation of 'learner-friendly' is theoretically bound. That is, they comment that whilst some academics may argue the case for behaviourist-oriented 'drill and practice' instruction, others may argue the case for the constructivist-oriented focus on exploration and creativity. This research provides a deeper analysis of the learner-friendly design of learning, as it is perceived by not only academics and researchers, but also the learners' themselves.

2.2.3 Learning Management Systems

Learning Management Systems are a popular authoring tool for delivering teaching and learning online. Petrovic and Kennedy (2005) report that Learning Management Systems are widely implemented within Higher Education institutions within Australia. They point out that Learning Management Systems are generally used for four purposes in academia: to present content or resources; to enable communication; to provide assessment; and administration of these features, which are available 24/7. Learning Management Systems generally include login according to three different user-views, student view, instructor view, and developer view. They may include content development tools such as 'multiple-choice questions', and generally include both asynchronous and synchronous communication technologies. There is a range of commercially available Learning Management Systems utilised by universities, these include WebCT, WebCT Vista, Top Class, and Blackboard. There are also other Learning Management Systems that are publicly available, such as Moodle, which are also used by academics and instructional designers from Higher Education. At the time of writing this research, the University of Tasmania was using WebCT Vista's Version 3.6 Campus Edition. This course management system enables academics to build multiple-choice or short answer quizzes, provides the ability to embed discussion boards and chat, and enables instructors to manage the administration of their students.

There has however been criticism of the design of Learning Management Systems. For example, at the Australian Computers in Education Conference in Adelaide, July 5th 2004, David Jonassen spoke against the design of current Learning Management Systems, believing them to enforce an objectivist (behaviourist) mode of teaching and learning. The belief that a Learning Management System may influence the instructional design of

courseware was an embedded belief behind the design of the open source software Moodle. This Learning Management System was designed to better allow a social constructivist mode of learning, by attempting to provide more navigational flexibility, and by providing a range of social collaboration tools, which are more easily embedded within the interface design. Partially due to the perceived design and development restrictions on Learning Management Systems, some Higher Education courses are utilising custom-made Learning Management Systems, which have been specially developed for their own teaching and learning needs. The experiences of the researcher found that it is much more common for custom-made Learning Management Systems to be utilised within the commercially corporate driven sector of teaching and learning online. In many cases Content Management Systems are used, which allow designers, developers, and end-clients to perform much of the features of Learning Management Systems, except many of the administration tasks such as student tracking. As it is less common for online collaboration to occur within professional training environments, no Content Management System that the researcher has come across includes asynchronous or synchronous communication tools. The researcher did come across a perception by practitioners, that customised Content Management Systems provide more flexibility in terms of designing the 'look and feel' (interface) of courseware, and the navigational design. Due to the perceived limitations on Learning Management Systems and Content Management Systems, the researcher designed and developed the prototype courseware evaluated in this research utilising html programming code in Dreamweaver MX software, as opposed to a Learning Management System or Content Management System.

2.3 Learner-Centered Design

Table 2.3.1 Traditional Teacher-Centered Design Paradigm versus Emerging Learner-Centered Design Paradigm

Teacher-Centered Design	Learner-Centered Design
Strongly influenced by objectivist epistemology	Strongly influenced by constructivist epistemology
Teacher as 'sage', deliverer of predefined knowledge, student as recipient of knowledge	Teacher as 'facilitator', facilitates students' construction of knowledge, students interpret incoming knowledge based on their own prior knowledge
Course objectives and assessment pre-defined by teacher	Course objectives and assessment co-constructed between teacher and student
Students reliant upon teacher for direction	Students as independent self-directed learners
Passive learning mode, focuses on	Active learning mode, focuses on active

attrition of content via a predefined navigation route	exploration and construction of learning
Focus is on linearly covering the course content, and recalling the content through the teacher's point of view	Focus is on problem-solving and meaningful interactions in the construction of knowledge
Somewhat inflexible learning environment, less focused on addressing student needs	Flexible learning environment, which evaluates and addresses student needs

The table above indicates the main tenets of the traditional teacher-centered paradigm, compared to the emerging learner-centered paradigm that in theory at least, is starting to dominate the delivery of contemporary courseware in Higher Education. According to Soloway et al (1996) the traditional educational paradigm viewed learning as an 'information transmission process' where teachers are the main source of knowledge, and whose job it is to move information into the heads of students. In contrast to this, the emerging paradigm sees students as actively constructing and understanding knowledge, as opposed to passively receiving it. The role of the teacher on the other hand, moves to that of professional mentor, whom help students become independent and facilitates their construction of knowledge (Curtin University, 2004). Some researchers argue that the impact of the web is heralding a new learning paradigm, one that moves from teacher-centered instruction, to learner-centered instruction (Neo and Neo, 2007). It is important to point out however, that the web is simply a tool, and that new paradigms emerge from the development of educational theory into practice. It is also worth pointing out, that whilst the current literature is focused on the new paradigm emerging from the impact of the World Wide Web (see Fisher and Khine, 2003), and there is still a significant gap in the literature on students' perspectives of the learner-centered paradigm. In particular, there is still a need for a courseware based on learner-centered principles to be designed, developed and evaluated by learners, as well as academics and experts. Until students' voices are heard, then we cannot say a paradigm or a particular product is learner-centered.

2.3.1 Traditional Paradigm: Teacher-Centered Design

The World Wide Web is said by some researchers to be a major influence in shaping a new educational discourse. Whilst not all educators agree in regards to how the web will impact upon learning, there is general agreement that the way in which learning is delivered is a major influencing factor of the Internet (Quinton, 2003; Chang and Fisher, 2003; Myhill, Le and Le, 1999). It is clear that historically, new technologies have had a profound influence on the content and deliver of education, as well as teaching strategies. Thus, it is reasonable to assume that the Internet will also have a profound influence on the delivery and teaching methodologies on education. Whether shaped by the Internet, or coinciding with the rise of

Internet in Education, is the change in pedagogical philosophies from teacher-centric to learner-centric modes (Neo and Neo, 2007, Neo and Neo, 2002). The traditional teacher-centered paradigm of delivering Education was based on an objectivist philosophy and a behaviourist approach to instruction. Within a teacher-centered mode of education the teacher assumed the role of content expert and sole source of knowledge. The teacher is considered the 'sage on the stage', and is given power to disseminate knowledge for students' to acquire. As such, the teacher generally controlled what was learnt, and the pace of learning, which tended to make students' passive learners. Popular teaching methodologies associated with teacher-centered modes of instruction included programmed instruction, and drill and practice instruction. These modes of instruction included guiding the learner linearly through a predefined sequence of content, and testing their knowledge generally through multiple-choice exercises. Although Laurillard (1993) influentially argued for Higher Education to utilise learner-centered methodologies over a decade ago, arguably, the shift towards learner-centered teaching methods has been quite slow within Australian universities. In Australia's latest and most comprehensive study of online learning in Higher Education, Bell et al. (2003) commented on the need to investigate whether the traditional role of the lecturer as 'the sage on the stage' is appropriate for online learning, and whether they should become the 'facilitator on the side' (as associated with learner-centered strategies). The research of Bell et al. points to the need for more research into the pedagogical elements of online learning. In particular, there is significant leeway for research on designing courseware from a learner-centered approach, and discovering what students and academics' think about this approach, as opposed to experts in online learning who are quite vocal within the literature.

2.3.2 Emerging Paradigm: Learner-Centered Design

The emerging educational paradigm of learner-centered or 'subject-centered' design is now dominating the contemporary literature. Gustafson and Branch (2007) eloquently define learner-centered (subject-centered) instruction to mean "that learners and their performance are the focal point of all teaching and learning activities" (p.13). There has been a shift worldwide towards learner-centered methodologies, although these are happening at varying paces at varying places. Some researchers, such as Stephen Quinton (2003) believe that the Internet has transformed education by enabling a shift from a teacher-centric to a more student-centric mode of Education. Other researchers, such as Jonassen (2004) recognise that the technology does not change pedagogy, rather educators play a key role in the epistemological change within education. In contrast to the teacher-centered paradigm, the learner-centered paradigm is strongly influences by a constructivist epistemology (Neo and Neo, 2002). Whilst the traditional model of learning sees knowledge as predefined and external to the learner, the emerging learner-centered model of learning sees knowledge as constructed, de-constructed, and re-constructed by the learner (Knuth and Cunningham,

1993). Thus, learner-centered strategies emphasise the multiplicity of knowledge, and the need to scaffold students' pre-existing knowledge bases, to take into account new knowledge, in a way that is meaningful and appropriate. Teachers play an important role here, in moving from 'sage' to 'facilitator' of the learning process. Learner-centered design tends to be associated with open-ended discovery based methodologies, although not all discovery-based methodologies are necessarily learner-centered.

Many academics point out that both teacher-centered and learner-centered methodologies are valid, and emphasise that courses will often reflect elements of both teacher-centered and learner-centered methodologies (Nunan, 1988). Nevertheless, there is a significant gap in the literature on the move from theory to practice. That is, whilst there is a vast literature base on the theory of learner-centered design (see the APA's Learner-Centered Psychological Principles), there is gap in the literature on how the theory may be appropriated into developing a learner-centered fully-online courseware in practice. Furthermore, although the theory is said to be learner-centered, there is also a significant gap in the literature on learners' perspectives of learner-centered principles, in contrast to academics and experts. In short, it is unclear what learners' perceptions of 'learner-control', 'independent learning' and 'flexible learning' are. It may be, that for learning design to be truly 'learner-centered', it must utilise some elements of teacher-centered methodologies. This research attempts to help fill the gap in the literature, by obtaining learners', academics' and experts' opinions on elements of learner-centered design, as well as designing a learner-centered courseware for Higher Education, and obtaining learners', academics', and experts' evaluation of this courseware, in an attempt to find out how a learner-centered courseware can be developed and how it is evaluated by a range of interested parties.

2.4 User-Friendly Design

2.4.1 Definition of User-Friendly Design

Interestingly, much of the theory-centered literature on eLearning tends to be focused within the realm of Higher Education. Likewise, much of the application of eLearning now occurs within business and industry settings (Richey, Morrison, and Foxon, 2007). Within all settings, the principles of both 'user-friendly' design and 'learner-friendly design' need to be applied for effective learning via courseware. Perhaps given that web-based learning is relatively new and innovative, there is a range of opinions on the user-friendly and learner-friendly design for courseware. When it comes to the user-friendly design there is general consensus amongst experts in web design on usability heuristics, although these are constantly evolving as web browsers develop and users become more familiar with Internet technology (Nielson and Loranger, 2006). There is however an ellipsis in the research on the

impact of user-friendly design, which addresses the 'user' as a 'learner' (Zaharias, 2006a). In particular, the influence user-friendly design has on learning via courseware.

Traditionally the goal of user-friendly design is to make websites 'easy-to-use', with the intended outcome being increased web traffic, online sales, and productivity. As such, the development of user-friendly design is generally 'user-centric', and revolves around the needs and limitations of the end-user. There is a strong literature base on the role and features of user-friendly design, as they apply to general website design (Nielson and Loranger, 2006; McCracken and Wolfe, 2004). When it comes to defining user-friendly design Myhill, Le and Le (1999) point out that the term means different things to different software designers and their clients, however the focus is about shifting attention towards the needs of the end-users. They point out that one of the main focuses of user-friendly design is the design of the interface is easy to use. Most definitions of user-friendly design are synonymous with the concept of usability. They include an interest in: (a) the technical elements of the software and hardware, such as whether the technology is functioning according to the expectations of the end-user (for instance, is the software designed according to the technical limitations of the hardware and software?); (b) the characteristics of the end-user, such as whether users are novices to the technology or highly computer literate (this may help decide what sort of help tools may be relevant); and (c) elements of the interface design, such as the screen design and layout, aesthetics, and interface design (for instance, is the site aesthetically attractive, does the 'look and feel' represent the target site's audience, and is the site easy to navigate?).

Perhaps one of the reasons why the definition of user-friendly design is so loose within the literature is that only a decade ago the World Wide Web was seen as a very new technology (Nielson and Loranger, 2006). Although educational and other types of computer aided learning software existed, the use of these tools was much less common within educational institutions such as Higher Education. Nielson and Loranger (2006) point out that people "expect a lot of Web sites today, and they are less and less tolerant of bad design" (p.xvii). They define usability as:

> "a quality attribute relating to how easy something is to use. More specifically, it refers to how quickly can learn something, how efficient they are while using it, how memorable it is, how error-prone it is, and how much users like using it" (p.xvii).

Internet.com provides a more generic definition of user-friendly design. They refer to user-friendly design as "anything which makes it easier for novices to use a computer" (www, 2008). They point out that examples of user-friendliness in software are menu-driven systems, as opposed to command driven systems, the use of graphical user interfaces (GUI), and the use of online help systems. MSN's online Encarta dictionary defies user-friendly software as that which is "easy to operate, easy to understand, easy to deal with"

(www, 2007). In her article on the link between online training and usability, Holly Dolezalek (2004) defines usability as a "a generic term of design features that enable something – a software package, a Web-based course – to be user-friendly". Dolezalek (2004) quotes Marcia Connor – the CEO of the company Ageless Learner, who believes that "High usability means a system is easy to learn and remember, efficient, visually pleasing and fun to use; and quick to recover from errors" (p.32). In the article, Connors points out that usability is often missing in online training programs, and says that this may result in inconsistent design (different interfaces and navigation). As a result, she believes that learners are inconvenienced because they need to learn how to use the system, before they can learn the material. According to Connors, part of the reason why poor usability design occurs within online learning is that designers either have knowledge of 'visual design' or 'technology augmented education', "but almost never of both" (p.32). She points out "instructional design is important, but it simply not enough when a company is trying to develop a product that will be used and returned to" (p.32).

There is a strong literature base on the role and features of user-friendly design, as they apply to general website design (Nielson and Loranger, 2006; McCracken and Wolfe, 2004). The problem with general user-friendly design however is that it doesn't take into account a context where learning is the intended outcome. Thus, a courseware may be user-friendly to a general audience, but learner-unfriendly for an audience whose primary aim is to use the courseware for learning. Researchers point out that uniting both instructional design and usability tends to be problematic within the literature and practice of courseware design, partly because there appears to be a lack of collaboration between experts within user-friendly and instructional design (Squires, 1999; Zaharias, 2004). There is a growing literature base, which supports the need for eLearning to take into accounts both learning theory and usability (Myhill, Le, and Le, 1999; Zaharias, 2004; Zaharias and Poulymenakou, 2006a; Danielson, Lockee, and Burton, 2000). This means developing web-based heuristics (guidelines for design) as they apply specifically to a context of learning. The need to create specific heuristics for courseware is supported by web-usability experts, such as Nielson and Loranger (2006), whom in their book *Web Usability* point out that specific usability design and evaluation should occur for specific/niche area websites. There is a growing literature base on design guidelines for eLearning according to experts (see Clark and Mayer, 2003), however there is a significant gap in the literature on the perspectives of learners when it comes to the user-friendly design of courseware.

2.4.2 General Heuristics for Web Site Design

Despite the growing awareness of the importance of user-friendly design within courseware, there continues to be a major gap in the literature on learner-centered heuristics for

courseware design. Some researchers believe that following general web guidelines can be useful. For example, Danielson et al. (2000) comment:

> "the HCI field has its own experts and literature base; it is not necessary for all instructional designers to develop yet another expertise. Simply knowing basic interface design concepts will go far in the creation of effective Web-based instruction and the facilitation of learning in this electronic environment" (p.127).

The concern here however, is that researchers are not sure about which design guidelines impact upon learning. As a result, courseware may be user-friendly, but on the other hand it may not be learner-friendly (Myhill et al., 1999; Danielson et al., 2000). Zaharias and Poulymenakou (2006b) point out the challenge for most e-learning designers is that an established set of heuristics do not exist. They emphasise that many guidelines are not adequately adapted for web-based learning environments. Furthermore, that the perspectives of learners' tend to be silenced, as much of the research focused on developing eLearning heuristics and evaluation methods reflect the views of experts. Thus, standards for user-friendly courseware design cannot evolve, until we have a clear understanding of how these features impact upon students. This research intends to addresses this gap in the research, by attempting to garner how aesthetics, screen design and layout, navigation, and usability impact upon learning.

Before new usability guidelines for web-based design can be established, it is important to look at existing guidelines. The University of Tasmania's (UTAS) department of Web Services (2005) published its guide to web usability heuristic analysis. These included:

- Flexibility and efficiency of use: catering to both novices and experienced users;
- Recognition rather than recall: ensuring the user doesn't have to memorize information from one screen to another;
- Visibility of the system status: keeping users informed on what is going on;
- Match between the system and the real world: using the language of the users;
- Consistency and standards: following consistent design conventions;
- Help and documentation: providing necessary help tools such as a search bar;
- Help users recognise, diagnose, and recover from errors;
- Error prevention;
- User-control and freedom: for instance, provide the tools 'undo' and 'redo'; and
- Aesthetic and minimalist design: include only what is necessary in the design (pp 1-2).

In the September/October 2002 edition of iQ Magazine Jill Griffin provides a list of common usability attributes amongst highly usable e-commerce web sites. These include:

- Intuitive: user's can rely on common sense to navigate the web site;
- Simple: web pages are straightforward and devoid of jargon or pointless graphics;
- Fast: pages are fast to download;

- Reassuring: customers have clear feedback;
- Consistent: there is consistent page design, content, and structure;
- Forgiving: customers can easily correct their errors and access help; and
- Pleasing: the web site it visually interesting and attractive.

Griffin's article points out that poor usability may have a negative effect on both sales and corporate branding, and that common examples of poor usability include "Cluttered home pages, poorly organized information, confusing or complex navigation, slow loading pages, and frustrating check out processes" (www, para. 4, 2002).

Nielson and Loranger (2006) provide a more specific guide to heuristics. They point out that eight usability problems that haven't changed in their study of web site usability include:

- "Links that does not change colour when visited;
- Breaking the back button;
- Opening new browser windows;
- Pop-up windows;
- Design elements that look like advertisements;
- Violating Web-wide conventions;
- Vaporous content and empty hype;
- Dense content and unscannable text" (p.60).

They point out that despite radical changes in the technology, usability standards haven't radically changed. They believe that this is because "usability is a matter of human behaviour, and people does not change much from one generation to another" (p.84). Haven just provided a list of some of the more common usability guidelines in the literature, we can now move on to some of the more specific user-friendly guidelines for courseware.

2.4.3 User-Friendly Design for Courseware

Zaharias and Poulymenakou (2006b) point out the need to address 'users' as 'learners', in order to build systems that are both usable and pedagogically meaningful. They emphasise the need for user-centered design to become learner-centered design. This means incorporating both usability principles and learning theories. They point out that the goal for learner-centered design is to "design software that makes people want to learn and know how to learn, beyond the computer task at hand" (p.88). They believe that it is crucial for the learner-centered design paradigm to take into context metacognitive skills (learning how to learn), constructivistic tenets, affect and motivation to learn. They also recognise however, that it is not clear how such concepts and instructional design techniques can be integrated with human-centered (user-friendly) design methods. This research does not seek to create its own comprehensive list of heuristics for user-friendly courseware design. Rather, it seeks to look at some existing user-friendly heuristics for courseware, and investigates how learners' perceive these heuristics compared to academics and instructional designers.

Particular attention is paid in regards to how aspects of the user-friendly design, such as screen design and layout or navigation, may impact upon the ability for learners' to learn online. The research also investigates learners' perceptions of learner-friendly courseware design, such as their opinions on problem-based open-ended learning environments, which are popularly associated with designs based on constructivistic epistemologies. The purpose is not to provide a comprehensive framework for learner-friendly courseware design, but to look at how the learner-friendly design may impact upon the design of courseware according to the participants' whom use it.

Panagiotis and Poulymenakou (2006c) point out following general web guidelines can be useful, however these stem from e-commerce frameworks and not all heuristics (guidelines) can be applied direct to the design of courseware. They point out that the problem is that an established set of guidelines, adapting heuristics and usability standards for eLearning, is yet to be developed. Their literature review quotes a number of studies that have attempted to adapt general web-based heuristics for courseware design. For instance they quote Soloway and Preece's (1999) study, which takes Jakob Nielson's (1994) heuristics and adapts them to social constructivist tenets. Their proposed heuristics for courseware design included:

- Heuristic One: Match between designer and learner models;
- Heuristic Two: Navigational fidelity;
- Heuristic Three: Appropriate levels of learner control;
- Heuristic Four: Prevention of cognitive errors;
- Heuristic Five: Understandable and meaningful symbolic representations;
- Heuristic Six: Support personally6 significant approaches to learning;
- Heuristic Seven: Strategies for cognitive error, recognition, diagnosis and recovery; and
- Heuristic Eight: Match with the curriculum.

Panagiotis and Poulymenakou (2006c) also quote Reeves et al's (2002) study, which provided fifteen heuristics emerging fro a combination of instructional design and usability heuristics, which are used to evaluate the usability of courseware. In "Instructional Design Heuristics for E-Learning Evaluation" Reeves et al's (2002) protocol for the heuristic evaluation of courseware includes the following fifteen heuristics:

- Heuristic One - Visibility of the system status: keep the user informed about what is happening;
- Heuristic Two - Match between the system and the real world: use familiar metaphors and language;
- Heuristic Three - Error recovery and exiting: allow easy recovery from input errors;
- Heuristic Four - Consistency and standards: use general software conventions;
- Heuristics Five - Error prevention: prevent common problems;
- Heuristics Six - Navigation support: design intuitive navigation;
- Heuristic Seven - Aesthetics: avoid irrelevant content and bells and whistles;

- Heuristic Eight - Help and documentation: provide readily accessible user-help;
- Heuristic Nine - Interactivity: provide content-related interactions and tasks which support meaningful learning;
- Heuristic Ten - Message design: present information according to the rules of information processing;
- Heuristic Eleven - Learning design: Design in accordance with sound principles of learning theory;
- Heuristic Twelve - Media Integration: include media with clear pedagogical and motivational purpose:
- Heuristic Thirteen - Instructional assessment: provide assessments aligned to the objectives;
- Heuristic Fourteen - Resources: provide learning-related resources; and
- Heuristic Fifteen - Feedback: provide contextual and relevant feedback.

Zaharias and Poulymenakou (2006c) point out that the problem with existing usability heuristics, is that they tend to reflect the views of experts, as opposed to learners. Furthermore, they also believe that much of the work needs further elaboration and empirical validation. Their design guidelines for asynchronous eLearning attempts to adopt a learner-centered approach that accommodates the traditional web usability and research from the area of instructional design. Their nine design guidelines include:

- Design Guideline 1 - Design interactive content: This includes illustrating concepts with specific examples, using activities to gain the attention of, and motivate learners, providing access to meaningful interactions when there are long sections of text, providing access to resources appropriate to the learning context and for use in the real world; and developing media to highlight critical concepts, rather than entertaining and distracting learners;
- Design Guideline 2 – Provide constructive and instructional feedback: This includes providing where appropriate, higher order assessments (e.g. case studies, discussion topics) over lower-order assessments (e.g. simple quizzes), and providing feedback tailored to content/task/activity being studied by the learner;
- Design Guideline 3 – Support Navigation: This includes allowing the learner to exit when needed but returning to the closest logical point when needed, providing an example of the hierarchy of the course content, providing paths showing where the learner is at the moment, and giving descriptive names of the course content;
- Design Guideline 4 – Promote Visual Design: Place important information in areas most likely to attract learners' attention, ensure text and graphics are legible, ensure fonts are easy to read in print and on-screen versions of content;
- Design Guideline 5 – Provide Learner Guidance: Include an overview and summary, offer tools that support learning (e.g. glossary, resources), provide clear learning objectives;

- Design Guideline 6 – Design for Learning: Provide opportunities and support for learning through collaborative interaction with others (e.g. discussion), make it clear to the learner what is to be accomplished and what will be the learner gains, include activities that are both individual and group based, and provide learners with opportunities for reflection;
- Design Guideline Seven – Make it Accessible: Make courseware easy to install, uninstall and launch, make courseware free from technical problems (e.g. hyperlink and programming errors);
- Design Guideline Eight – Enhance Learnability: Design course layout so that learners can develop learning activities without extensive consultation of online help, develop the course so that learners can start the course (e.g. registering for the course) using only online assistance, provide hints so that learners should know what they should do if they get stuck or have questions;
- Design Guideline Nine – Inspire Motivation to Learn: Incorporate novel characteristics, stimulate further inquiry, make it enjoyable and interesting, allow for learner to make decisions, Provide learner with frequent and varied learning activities that increase learning success, and provide explicit criteria for learning success.

Panagiotis and Poulymenakou's web usability guidelines are unique because they purposely take into account the research on learner-centered instructional design (2006c). Other design guidelines tend to provide 'expert advice' on design, without necessarily establishing why these guidelines are relevant to the process of learning or whether they're informed by specific instructional design theory (See Swan, 2003; Keeton, Scheckley, and Kreji-Griggs, 2002; Janicki and Liegle, 2001; Chickering ad Ehrmann, 1996). As Panagiotis and Poulymenakou (2006c) make it clear, there is significant need for further research into the development and evaluation of web usability guidelines for learning. Although these researchers point out that more discussion of design guidelines for eLearning will take place in the future, according to them it is the empirical evaluation of courseware that will add significantly to designer's pool of knowledge.

Again, when it comes to this research, it should be emphasised that the researcher does not set out to create an in-depth framework of design guidelines for generic courseware usability. In short, the researcher believes that it is probably impossible to design a 'one-design fits all' solution, given the complexities on the multiplicity of theories on how learners learn, and the different contexts on each learning environment. As Stephen Quinton (2003) notes:

> "Teaching is not about delivering content as through it is water channelled down a pipe nor can the process of learning be compared to filling an empty bucket with water. Such a model cannot embrace all the complexities of learning" (p.544).

Rather, the researcher seeks to look at existing user-friendly and learner-friendly design guidelines, and investigate how a range of contemporary participants view these features,

including experts, academics, and learners. This research also seeks to obtain open-ended feedback from these participants, on their perspectives of the potential strengths and weaknesses of contemporary courseware design, in order to obtain some emerging perspectives on the user-friendly and learner-friendly aspects of courseware design, and to reaffirm some existing opinions on courseware design. Since much of the literature on design guidelines for courseware provide expert opinions as opposed to real-world examples, this research attempts to go one step further by utilising existing web usability and instructional design guidelines to develop a prototype courseware, and obtaining feedback from experts, academics and students regarding the strengths and weaknesses of the example design. Hopefully, the range of feedback will provide some interesting insights regarding a select group of experts, academics, and learners' opinions on courseware evaluation, which will help affirm some existing guidelines, and potentially lead to the creation of new design guidelines not previously addressed in the literature. For example, does the research on design guidelines for courseware, easily translate in practice? Does a participants' occupational background significantly affect their opinions on courseware design? For instance, is there a significantly difference of opinion on the user-friendly or learner-friendly design of courseware between learners, compared to experts and academics?

2.5 Learner-Friendly Design

Myhill Le and Le (1999) recognise that problems arise when applying the term user-friendly in education. For example, they note that a software package aimed at making users 'happy and friendly' may not be good for learning. They note this is particularly true with many computer games, which may be user-friendly but educationally 'unfriendly'. Due to the difficulty in applying the term user-friendly in education, the researchers introduced the term 'learner-friendly, which emphasises an educational perspective in the evaluation of computer aided learning software. It is important to reiterate that both user-friendly and learner-friendly design needs to be implemented in order to develop effective learning environments. Arguably, both terms are co-dependent upon each other. For instance, a courseware may be user-friendly (easy to use) but it may utilise an ineffective pedagogical method for the type of learning that is required (this makes it learner unfriendly). On the other hand, a courseware may be learner-friendly and utilise the appropriate pedagogical methodology, but be designed in a way that is user 'unfriendly'. Thus, a consideration of both user-friendly and learner-friendly design is essential. Whilst user-friendly design involves a consideration of screen design and interaction features that enhance usability, learner-friendly design involves a consideration of the epistemological grounding behind the design (e.g. objectivist or constructivist), the pedagogical methodology that is used, and a consideration of how students learn (e.g. considering learning styles), so that the potential for learning is optimised.

Whilst researchers' take it for granted that the purpose behind good courseware design is to enable learning (Jonassen, Cernusca and Ionas, 2007; Merrill and Wilson, 2007b) there is little research on students' perspectives behind the pedagogical design of courseware. That is, do students believe that the purpose of courseware is necessarily to enable effective learning through the learning design? Or do they see courseware simply as a group of resources, which they may look at if they feel the urge? This research seeks to find out more about contemporary participants' perspectives regarding educational philosophies in courseware, as well as their belief systems on their definition of courseware. There is a significant body of literature on both user-friendly and learner-friendly design, which learner-centered courseware encompasses, however little attention has been paid to designing, developing and evaluating learner-centered courseware. At the heart of this issue is the confusion on the definition of instructional design, both in terms of its pedagogical context and in terms of an eLearning context. When it comes to the pedagogical context of instructional design, there is disagreement on the characteristics of instructional design.

Reigeluth's (1999) chapter defining instructional design pointed out that the current paradigm of education and training was moving from one based on conformity and compliance (teacher-centered instruction), to one that was based on diversity and initiative (learner-centered) instruction. Reigeluth believed that the role of instructional design and instructional design theory was moving away from teacher-centered methodologies where the focus was on presenting the material, teacher-control, and passive learning, to learner-centered methodologies where the focus is on making sure learners' needs are met, learner-control, and active learning processes where the student shares control and responsibility of their learning. In short, Reigeluth believed that the educational paradigm of instructional design was moving from one based on a behaviourist epistemology, to one based on a constructivist epistemology. A decade later researchers such as Gustafson and Branch (2007) affirm that instructional design is learner-centered, and that the learners and their performance are the focal points of all teaching and learning activities. They reaffirm the paradigm shift from one based on teacher-control, to one based on learner-control and oriented towards a constructivistic epistemology that focuses on goal-oriented, collaborative and meaningful learning. In contrast to this Merrill et al (1996) question the legitimacy of constructivistic approaches for instructional design, and appears to support an objectivist/behaviourist epistemology, by pointing out that instructional design should promote the 'acquisition of knowledge and skills" through 'scientific methods'. Stubbs and Watkins (2000) also points out that whilst constructivist learning is advocated by researchers in the contemporary literature of instructional design, there is pressure from students to adopt a more behaviourist approach which focuses on recalling lecture content for assessment. Furthermore, John Bain (2003) questions whether we should preserve some aspects of objectivism/behaviourism, by pointing out the complex relationship between teaching and learning and the need to

reconcile the importance of teaching (instruction) with ensuring students do the learning (independent learning).

As much of the literature on the pedagogical aspects of instructional design focuses on experts' opinions, there is a strong need for more research on experts, as well as academics and students' perspectives on the teacher-centered (behaviourist) and learner-centered (constructivist) aspects of courseware design, in order to better understand what it means for courseware be learner-friendly. It is the belief of the researcher that the development of instructional design theory in the future is strongly reliant upon reconciling what it means to be 'learner-friendly' in an online environment. Part of this involves designing learner-centered courseware according to the contemporary theory, and getting a range of participants to evaluate this courseware in order to better understand teachers' and learners' perspectives of courseware design. In order to develop a learner-centered design for courseware, it is also important to consider the usability aspects of design. Interestingly, no definition of instructional design that the researcher has come across refers to the implementation of both user-friendly as well as learner-friendly aspects of design. The virtual 'e' component of eLearning still appears to be missing from definitions of instructional design for eLearning. In order to reconcile these differences, this research attempts to design a courseware based on both the tents of user-friendly and learner-friendly research. This research focuses on the perspectives of a range of participants on the evaluation of a prototype courseware based on user-friendly design along with learner-centered constructivistic tenets, in order to better understand how effective the theory on courseware design, translates into practice.

It has been established above that little attention has been paid to designing, developing and evaluating learner-centered courseware in the literature, due to the disagreement on the nature of instructional design (i.e. should instructional design be based on behaviourist or constructivist epistemology and the fact that most instructional design theories tend to consider the 'user-friendly' aspects of courseware design (the 'e' of eLearning) as separate from the learner-friendly design. It should also be put forward however, that another reasons why there is only a small literature base on the design, development and evaluation of learner-centered courseware, could be because of the fact that most instructional design is undertaken in the commercial sector by designers by contract whom are untrained on instructional design theory (Richey, Morrison, and Foxon, 2007; Merrill and Wilson, 2007), and the learning design in these situations tends to take second place to the whims of administrators and clients. Because of this, there is strong need for more literature on the importance of designing for learning, in order to help convince those in control of its development of its relevance.

2.6 Behaviourist and Constructivist Epistemologies and Designs

As we have established above, the concept 'learner-friendly' and its related educational principles are still debates by researchers in courseware development. There is still a gap in the literature on what it means for courseware to be 'learner-friendly'. In particular, there is still disagreement amongst researchers in regards to whether a constructivist epistemology should replace a behaviourist epistemology, there is still a significant gap in the literature base on learners' perspectives of constructivistic learning, and there is also a gap in the literature on how research on constructivism can be converted into developing a fully-online courseware. The two major learning theories of behaviourism and constructivism have influenced the instructional design of educational technology (Le and Le, 2007). Both models of instruction produced from these theories are useful, though in different contexts (Jonassen, 1994; Sevilla and Wells, 2001). Academics generally agree that a behaviourist methodology that provides direct instruction to learners tends to be best for well-structured problem, which does not require multiple answers or problem-solving. On the other hand, they also argue that this methodology tends to encourage route learning and memorisation, and is not suitable for ill-structured problem types. Instead, researchers argue that courseware designed using a constructivist philosophy is most appropriate here (Baker, 2007; Kocaman and Ozden, 2006; Lee and Kim, 2003; Jonassen, 1997). Ill-structured problem types are problems with multiple solution paths, which require creative higher order thinking in order to problem-solve. Approaches based on a constructivist epistemology, such as problem based learning, collaborative learning, and anchored instruction tend to be most effective for solving these types of problems, as they necessitate creative and deeper thinking approaches (Leader and Middleton, 2003, Lee and Kim, 2005, Brickell et al., 2001; Jonassen, 1997).

Most academics agree that learning within Higher Education necessitates students to become independent and deep learners, because the type of problems they deal with tend to be focused on the type of conceptual thinking common amongst ill-structured problem types. Nevertheless, there is still debate in the literature on the implementation of constructivist theory into practice, and hesitations amongst some academics and students in regards to adopting a constructivist learning approach. In other words, there still appears to be some level of support for behaviourist learning, despite Jonassen, Cernusca and Ionas (2007) assertion that constructivism has had a significant influence on educational theory and practice. The theory and issues on behaviourist and constructivist learning environment are discussed below.

2.6.1 Objectivist Epistemologies and Designs

Skinner's studies on behaviourism directly influenced instructional design, to create a teacher-centered approach to instruction that has dominated instruction since the 1960s (Lefoe, 1998; Sevilla and Wells, 2001). Behaviourist instruction adheres to an objectivist epistemology that considers knowledge as being single dimensional, and fixed. It is associated with a high level of teacher-guidance and direction, attention towards lower order thinking skills such as recall and memorisation, and fostering learners' ability to recall knowledge as opposed to constructing their own interpretations. Behaviourist instruction generally involves developing a set of instructional sequences, with predetermined outcomes (Lefoe, 1988). This often consists of a series of interfaces, generally ending in a multiple-choice quiz that tests memory, with feedback from the original content material for remediation (Sevilla and Wells, 2001). The purpose is for the learner to move through a set of predefined instructional sequences, each covering specific content relating to the course objectives which have been pre-designed by the instructional designer, and followed by an assessment that typically tests learners' ability to route-recall the content they've covered in order to successfully fulfil the course objectives. In short, paradigms based upon behaviourism focus on recalling instructional goals, defining concepts and performing procedures (Almala, 2005). The problem with behaviourist instruction however, is that it is considered ineffective for problem-solving, and 'ill-structured' problem types, which requires innovative and creative learning. For this type of learning, theorists recommend constructivism (Sevilla and Wells, 2001; ; Jonassen, 1999; Jonassen 1997).

Generally, there is little support within the contemporary literature for teaching models which promote behaviourist learning, nevertheless, as Herrington and Standen (2000) note, the theoretical foundations of many multimedia programs are still based on behaviourist principles. Within the practice of instructional design, particularly within the training industry, there is still relatively strong support of behaviourist instruction, perhaps given that this mode of instruction played a strong role in the early stages of instructional design's inception. Within the practice of instructional design, particularly within Higher Education, there still appears to be support of behaviourist instruction, whether it be as a guiding philosophy, or as a complementary toolkit along with constructivism (Hannafin and Hill, 2007). Although there is strong support of constructivist approaches compared to behaviourist approaches, when it comes to the design of learning environments (see Zhang 2002; Kaur, 2000; Auh and Krummich, 1998), there is still some contemporary literature that suggests that support for behaviourist learning still exists amongst academics (Merrill et al, 1996) and students (Stubbs and Watkins, 2000). This could be why some academics are pointing to the inevitability of new design frameworks that incorporate aspects of both behaviourism and constructivism (Deubel, 2003).

2.6.2 Constructivist Epistemologies and Designs

Researchers point out that constructivism is an epistemology, as opposed to a methodology (Jonassen, Cernusca and Ionas, 2007). Nevertheless, constructivism has had a significant impact upon educational technology, and there are many theories based on constructivism that have had a significant influence upon the way in which academics and designers approach the task of teaching and learning online. Constructivism is a learner-centered approach to learning (Perkins, 1991). Constructivist theories focuses on the learner as an active participant in the learning process, whereby learners are encouraged to set their own objectives, and pace their own learning (Neo and Neo, 2007). As Schank (1993) points out, good educational software is active, and students should be doing something and not watching something. Whilst there are several schools of constructivism, for example, personal, social, information-processing, and communal (Lefoe, 1998), the central tenet of all constructivist theories is that knowledge is actively constructed by learners, rather than directly transmitted from the teacher (Sesemane, 2007). Constructivists also believe, that because knowledge is constructed, reality is defined by multiple perspectives, thus the role of the teacher must move to that of facilitator and mentor in order to scaffold learners' construction of reality towards more appropriate solution paths. Finally, constructivists believe that learning should be embedded in 'real-world' environments that emphasise 'real-world' complexities and encourage learners' to personally reflect upon the problem/case at hand, and collaborate with their peers and/or teacher in order to effectively create new knowledge structures and sole the complex problem at hand. It is worth emphasising, the role of teacher as mentor, as opposed to dictator and sole source of knowledge as common amongst teacher-centered and behaviourist approaches to learning.

Constructivism has become a buzzword in contemporary educational design, and there is general agreement amongst researchers' that constructivism is more effective for higher order thinking and creative problem-solving (Brickell and Herrington, 2006; Zhang, 2002). Nevertheless, there is still debate amongst researchers' in regards to how appropriate constructivism is for designing courseware. For instance, Bell et al (2002) point out that one of the key issues requiring further research online is whether the teaching model should move from the traditional didactic method, to one based on a more discovery based methodology through technology. The researcher translates this issue, to whether approaches based on teacher- centered and behaviourist methodologies are more effective than those based on learner-centered and constructivist methodologies, within Higher Education courseware. One of the complexities in attempting to answer this question, is that there is still a significant gap in the literature on the design of constructivist-oriented courseware. In particular, whilst we may assume that discovery-based methodologies are necessarily constructivist, it is possible that unless the courseware actively encourages

learners' to construct knowledge that the courseware is not necessarily constructivist. Likewise, it is also somewhat dangerous to assume that courseware with relatively high levels of teacher-direction are necessarily behaviourist, unless the courseware encourages learners' to rote recall. It can be assumed however, that generally, behaviourist-oriented courseware is associated with high levels of teacher guidance in terms of the navigation, objectives, and assessment, and constructivist-oriented courseware is associated with a more open-ended approach to instructional and navigational guidance, and that learners' have more input into the construction of the objectives and assessment, compared to teacher-centered approaches.

David Jonassen created one of the most popular instructional design models, based on constructivist epistemology, of constructivist learning environments (CLEs). This model emphasises building learning environments that fosters, rather than controls problem s0olving. As Jonassen (1994a) comments:

> "Constructivists emphasize the design of learning environments rather than instructional sequences […] They do not seek to predetermine the sequence of instruction or prescribed set of activities and thought processes by the learner. Rather they seek to provide a supportive environment in which the learner can interpret at least a simulated reality in order to better understand reality" (p.35).

The strength of this model is that it provides an excellent base from which to start designing constructivist-based courseware, as well as understanding constructivism itself. Jonassen believes that CLEs should be used to keep students active, constructive, collaborative, intentional, complex, contextual, conversational, and reflective. As most models of constructivism seek to implement many of these themes, it is worth looking at each in detail. According to Jonassen: **active** learning means encouraging learners to actively manipulate objects and tools of learning, as students' tend to 'learn by doing'; **constructive** learning means encouraging learners to construct knowledge, as constructivists' tend to believe students learn by integrating prior knowledge with new knowledge; **collaborative** learning means encouraging learners to seek help in solving problems, as constructivists' tend to believe students learn by seeking others to help them solve their problems; **intentional** learning means supporting learners in articulating the goals of their learning, as constructivists' tend to believe students learn best by fulfilling their personal learning goals; **complex** learning means engaging students in solving complex and ill-structured problems as well as simple problems, otherwise learners' may develop oversimplified views of the world; contextual learning means simulating real world environments, other than forcing students to abstract ideas from rules that are memorized; **conversational** learning means encouraging learners to become part of a community of learners, as constructivists' tend to believe learning is a social process; and finally, reflective learning means encouraging learners to articulate and reflect upon what they've learnt because constructivists tend to

believe that learners understand more and are better able to use the knowledge they've constructed in new situations when they've utilised by process of reflection.

The theory behind the design of CLEs will be repeated in the discussion of the courseware prototype designed as part of this thesis, within Chapter Four. For now, it is worth pointing out that although Jonassen's theory of CLEs has been around for at least a decade, there is still a significant gap in the literature on the design, development and evaluation of constructivist-oriented courseware, either based on the theory of CLEs or constructivism in general. This may be because the concept of a learning environment (where the focus is on learning), as opposed to instructional environment (where the focus in on instruction), is still relatively new within instructional design (Lefoe, 1998). Although constructivism is said to be a learner-centered, the gap in literature on learners' perspectives of constructivism could be said to be somewhat worrying. This research attempts to obtain some contemporary perspectives on constructivist-oriented designs, as well as designing, developing and evaluating a prototype courseware based on constructivist theory. As we are focusing on constructivist learning, it is worth considering four potential weaknesses on the theory into practice.

- The first concern is the argument that if each user constructs a unique mental model it may be impossible to design a site that caters to all users' realities. In reply to this, Jonassen (1994a) points out that a misconception of constructivist is the inference we each construct a unique reality, which will lead to 'intellectual anarchy'. Social constructivists argue that through the process of social negotiation (collaboration) humans attach particular meanings to particular symbols and events. Thus, it is important to enable social collaboration and facilitate teacher mentoring within constructivist learning environments. More research is required however, in regards to how this social collaboration may be implemented within a fully-online courseware, and how some contemporary participants of courseware perceive this.
- The second concern is that too much learner control may actually hamper learning, due to a lack of task management and sequencing that acts as a guide for learners. Stubbs and Watkins (2000) found that there was a strong demand from students for more teacher-direction within courseware. More research is required into how a constructivist-oriented courseware can be designed in a way that attempts to address the problems emanating from the high level of learner-control required for learner-centered courseware, and evaluation on how some contemporary participants of courseware may perceive this.
- The third concern relates to motivation. Learner-centered methodologies are generally thought to increase motivation because they encourage 'active' user-participation. Jonassen (2003a) and Jonassen et al. (2003b) in particular believe that fostering constructivist learning aids learner motivation, because it encourages learners' to take

ownership of their learning, so that it is meaningful and relevant to them. In counter argument however there may be some students whom prefer a more traditional route of learning and higher level of teacher-guidance, particularly when it comes to the design of their objectives and course goals. In particular, Stubbs and Watkins (2000) found that there was strong demand from students for teacher-centered guidance regarding the course goals. The researcher has also felt that there is support in the practice of instructional design, for pre-defined learning outcomes, and a hesitation against letting students have too much influence over their learning outcomes. More research is required regarding students' perspectives of co-constructing their learning goals, as well as looking at how goal-directed learning may be designed in practice.

- Finally, perhaps the biggest potential concern relating to constructivism is the issue of assessment. One the one hand, constructivists argue that the completion of the task itself is the rewards, and that a criteria-based methodology will only encourage learners to take a surface approach to learning. Nevertheless, there is a lack of literature on learners' perspectives of deeper learning. In other words, do learners' motivated by deep learning? Furthermore, it is still somewhat unclear how a fully-online courseware that utilises problem-based goals and encourages flexibility in assessment may be designed, and how a range of contemporary participants may evaluate this.

Lefoe (1998) pointed out a decade ago, that current models do not provide effective strategies for designing constructivist learning environments. This still has not changed, and there is still a significant gap in the literature on the design, development, and evaluation of constructivist learning environments. Although constructivism has become a buzzword in the contemporary literature, and is even starting to be considered by some practitioners to be 'yesterdays theory', the translation from behaviourist to constructivist methodologies is still slow. Some academics (Almala, 2005) are still only documenting the translation as recent. Although some academics support constructivism, they tend to focus on the theory and tools behind constructivism, as opposed to learners' evaluation of constructivist courseware (see Almala, 2005; Angliss 2003). Having just considered four potential weaknesses on the translation of theory into practice and some of the resulting gaps in the literature, it is worth looking at some existing examples of constructivist learning on the web.

There is a growing literature base on the design of constructivist-oriented learning environments. The literature on constructivist-oriented learning environments can be divided into three groups: firstly, the literature which describes the theory and design behind constructivist learning environments; secondly, the literature which discusses the design and development behind constructivist learning environments; and thirdly, the literature which covers the design, development and evaluation of constructivist learning environments. The literature from each of the three groups will be briefly discussed below. It is worth pointing out that much of this literature focuses on expert's opinions on the design of constructivist

learning environments, and that the voices of students and even academics receive very little attention in regards to the development and evaluation of constructivist learning environments. It is also worth noting that arguably, there is no literature that focuses in-depth on the design, development and evaluation of a user-friendly and fully-online courseware for Higher Education, which is based on constructivist learning principles. Most of the literature that surrounds constructivist learning environments within Higher Education courseware focuses on the theory

The vast majority of the literature on constructivist learning environments focuses on the theory and design behind constructivist learning environments (Jonassen, 1999; Kaur, 2000; Hirumi, 2002; Gros, 2002; Swenson and Curtis, 2003; Demirbilek, 2004; Almala, 2005). Expert's opinions on their interpretation of constructivism is provided, and more often than not a model for constructivist learning environments is detailed based on the experts' interpretation. These interpretations tend to be strongly embedded within a theoretical and conceptual framework, as opposed to a practical application that gives examples of the theory into practice. In "Constructivist Learning Environments on the Web: Engaging Students in Meaningful Learning" Jonassen (1999) looks at how technology can be used in a constructivist framework to engage students in meaningful tasks and foster learner-centered learning as apposed to teacher-centered instructor teaching. He provides a model for supporting constructivist learning through the design of constructivist learning environments. He includes a section on supporting constructivist learning, through modelling (providing worked examples of the task), coaching (to boost learners' confidence), and scaffolding (manipulation by the system of the task itself). In " A Web Based Constructivist Learning Environment For Schools: A Malaysian Example" Kaur (2000) discusses a model that he developed based on constructivism, using the web as the main interaction platform. The model looks at supporting active learning through cooperative and collaborative learning, and contextual support through the availability of learning resources, electronic workspaces, and the presence of a teacher. The guiding philosophy behind Kaur's design is based strongly on learner-centered constructivistic principles, which "the student thinks, the teacher guides, and the computer facilitates" (p.897).

Hirumi (2002) also presents a framework for designing learner-centered technology rich environments, which helps educators implement constructivist approaches as opposed to behaviourist approaches to design. The article suggests implementing eight instructional events for facilitating knowledge construction, and provides a brief discussion of all eight events. These include 'setting the challenge', 'negotiating the learning goals', 'negotiating the learning strategies', 'constructing knowledge', 'negotiating performance criteria', 'conducting self, peer, expert assessment', 'monitoring performance and providing feedback', and 'communicating the results'. Hirumi recognises that learner-centered models may be

challenging to some students whom prefer more direct modes of instruction, and that the reliance upon technology may be confronting for those whom are relatively new to relying on technology for tasks such as email. In “Constructivism and Designing Virtual Learning Environments” Gros (2002) discusses the main contributions and as well as the potential limitations behind constructivism. He discusses the theory behind the design of constructivist learning environments, which focus on learning as opposed to teaching. He points out that whilst constructivist approaches may help students solve complex problems which are prevalent in contemporary society, significant ‘behind the scenes’ work is required in order to effectively integrate constructivism into practice. For instance, when it comes to sequencing tasks they point out that sometimes it is necessary to go from ‘complex to simple’, as opposed to scaffolding students by going from ‘simple to complex’. They point out for example, that sometimes when a simple task is presented, students need to look behind the scenes into the complexity of the task, in order to face a better understanding of the context of the task.

In “Designing and Using a Constructivist Online Learning Environment in an Online Course” Swenson and Curtis (2003) detail the theory and design behind a ‘well conceived’ constructivist learning environment. They discussed the theory and design of a constructivist learning environment for a course on the ‘Foundations of American Education’. The course they described was created from face-to-face materials from the course, and was low in cost. It included reading assignments, discussions, resources, and case studies. Although the researchers pointed out that online experience can rival the face-to-face experience in terms of equity of ideas amongst students, they do not provide an in-depth description of how the design was constructivist, how the course was developed, or how students evaluate the environment. In “A review of Simulation to Constructivist Learning Environments” Demirbilek (2004) provides an overview of using simulations in constructivist learning environments. Demirbilek provides an overview of the literature on simulations of constructivist learning environments, and points out that they provide ‘authentic real world environments’ for students. The researcher believes they address constructivistic learning by providing multiple representations of reality, authentic real world settings, scaffolding (providing help when needed), learner control, motivation and interaction. He also points out that they could be used in four examples of constructivistic learning environments: situated learning environments, discovery learning environments, constructivist learning environments, and collaborative learning environments. The researcher does not however provide details in regards to how a simulated constructivist learning design can be translated into practice, or how it may be perceived to those involved in its development and use. In “A Constructivist Conceptual Framework for a Quality e-Learning Environment” Almala (2005) talks about the current paradigm shift in education away from programmed instruction and towards knowledge construction. His paper provides discusses the theoretical concepts behind

constructivism, and provides a conceptual framework for eLearning based on constructivist tenets. Like Demirbilek however, his paper does not provide details of how his framework can be translated to the development of a constructivist courseware, and is expert-centered as opposed to learner-centered in terms of providing expert advice without necessarily looking at learners' perspectives on his framework.

As discussed above, some academics and researchers go one step further in the literature, and discuss the design and development of courseware based upon constructivist tenets (McNeil, 2001; Kearney and Treagust, 2001; Goldman and Torrisi-Steele, 2002; Angliss, 2003). In "Designing Constructivist Learning Environments for Visual Learning" McNeil (2001) discusses the design of a graduate face-to-face course on visual learning, based upon constructivist principles. The primary purpose of the course was for students to conceptualise, design and develop visually rich materials that support teaching and learning. McNeil's students went through five technologically-based projects, which helped them develop an understanding of design, apply their understanding of design, develop meaningful visual representations for environments outside the classroom, and develop skills in using graphic media tools like Photoshop. McNeil discusses each of the projects in detail, as well as providing screenshots of the development of each project. For instance, the second project entailed students a 3-dimensional virtual exhibit of a historical timeline, McNeil discusses the project design, and a screenshot of its end-result is provided. Kearney and Treagust (2001) also discuss the design and development of a computer program, in "Constructivism as a referent in the design and development of a computer program using interactive digital video to enhance learning in physics". Their paper provides a background on constructivism in the development of educational software. It then discusses the use of video to enhance learning in physics, and combines the two concepts to look at how constructivism is used to design and develop an example computer program. The purpose of Kearney and Treagust's project was based upon constructivist principles, that is, to provide students with the opportunity to articulate their ideas, reflect upon the viability of other students' ideas, reflet on their own ideas, and construct and/or negotiate new ideas. Their software used sixteen real world demonstrations (video clips), which students were encouraged to engage with in a classroom setting, in order to construct their understanding of 'Force and Motion'.

Whilst McNeil and Kearnery-Treagust look at how educational software is used in the classroom based upon a constructivist paradigm, Goldman and Torrisi-Steele look at the influence of constructivism on the development of a CD-Rom courseware, in "Constructivist pedagogies of interactivity on a CD-ROM to enhance academic learning at a tertiary institution". The courseware was designed by two academics from Education, for three subjects as part of a Bachelor of Education at an Australian university. Constructivist theory

was used as a referent in the design of the multimedia courseware. The CD-ROM included three subjects, each expected to take students three hours to complete. They authors detail activities from three out of ten modules, from the subject on 'Social and Environment Education'. Screen captures of the modules show the sequence of screens to generally include a text paragraph on the introduction to the module, text explanation that outlines the module in text and dot-points, a description of the problem, and some example answers. Students were also encouraged to discuss their answers providing examples where relevant. The authors provided specific examples of how each of their three activities were based on eight constructivist principles, including: (1) anchor all learning activities to a larger task or problem (2) support the learner in developing ownership for the overall problem or task (3) design an authentic task (4) design the task and learning environment to reflect the complexity of the environment that students should be able to function in at the end of learning (5) give the learner ownership of the process used to develop a solution (6) design the learning environment to support and challenge the learner's thinking (7) encourage testing ideas against alternative views and alternative contexts (8) provide opportunity for and support reflection on both the content and the learning process itself.

Angliss (2003) also discusses the design and development of a fully-online courseware in "Building Professional Practices Online". The author describes the design and development of a fully-online courseware for a post-university courseware delivered by the professional arm of Deakin University, for the Institution of Transport Engineers in the United States. Although constructivism was used as a referent to the instructional design philosophy, the author does not provide an in-depth analysis in regards to the theoretical principles behind constructivism, and how the courseware applies these principles. The article does however show the development of the courseware through a series of screen captures, and points out that a case study approach was utilised in order to engage learners. The course features were shown in the screen captures, and these included a printable quality improvement model for learners, a site map, interactive activities, and a final assessment involving twenty multiple-choice questions.

We have just seen that some authors present the theoretical aspects of courseware design, whereas others present the design and development of courseware design. Few however, provide an in-depth analysis discussing how their instructional design strategy is constructivist, and how these principles are translated into practice. Even fewer provide an evaluation of the courseware they've designed, from the perspective of those involved in designing and using the courseware. Some authors in the literature go one step further from those we've covered so far, and present the design, development and evaluation behind constructivist learning environments (Van Puffelen, 2001; Neo and Neo, 2002, Harrison, 2003; Neo and Neo, 2007). In "Designing Web Based Instructional Learning Environments"

Van Puffelen (2001) describes the design and construction behind a constructivist learning environment for a course that would be used by 180 students. The author discusses the facilitation of several group meetings by interested teachers, involved in the design and development of the courseware. The evaluation of the design by the teachers was used in order to redevelop the constructivist learning environment into an effective teaching and learning environment for students, before the start of the semester. In “Building a Constructivist Learning Environment Using a Multimedia Design Project – A Malaysian Experience” Neo and Neo (2002) discuss a multimedia design project which involves students constructing their own learning goals, taking responsibility for the design of their storyboards (the design of the project in its pre-development stage), as well as the multimedia authoring (development) and development of the design. The authors describe the roles of student as ‘controller, owner’ of their learning and teacher as ‘facilitator of student learning’ throughout the project, from planning, media representation, digitalisation, authoring, deployment, and creation of the CD-Rom courseware. Screenshots of an example student project on Martial Arts were shown, as well as an evaluation of the process. The evaluation found that students positively responded to the constructivistic methodology, enjoyed working in groups, and become active participants in the learning process.

In “A Constructivist Learning Environment for Learning Japanese as a Foreign Language” Harrison (2003) reports on a study were a language learner studying Japanese as a foreign language was provided with a constructivist learning environment from which to learn. Within this environment the foreign language learner was required to design a 2-week trip around Japan, based on research garnered from the World Wide Web and information from virtual chat discussions. The overall theme/metaphor of the project was a ‘Virtual Tour of Japan’. The evaluation of the project found that this learning environment helped the language learner with learning Japanese, however the student also found that the type of course metaphor used to structure the task was somewhat repetitious, and somewhat limited the student’s learning by decreasing motivation. Finally, in 'A constructivist approach to learning an interactive multimedia course: Malaysian student's perspectives’, Neo, Neo and Xiao-Lian (2007) discuss the theoretical aspects behind the design of learner-centered multimedia-based constructivist learning environments. The authors sought to provide an alternative method to enhance student learning process in the constructive perspective, through the development of a multimedia project embedded in a constructivist learning environment, and to study its impact on the learning process of Malaysian students. The study describes students’ development of prototype applications based on Malaysian culture for the Malaysian Tourism Board. The students were encouraged to be active participants in the learning process, and develop critical thinking and collaborative learning abilities. Neo, Neo and Xiao-Lian describe the development of students’ projects, at each of the six stages of development: group formation and task delegation; collaboration; pre-authoring; authoring,

post-authoring; and reflective thinking. Students were given a 20 item questionnaire regarding the effectiveness of the constructivist learning environment, as well as an open-ended component for student comments regarding their feelings on the development of the project and the collaborative nature of the task. The authors found that students were motivated to finish the project and see their final results. They also found that the learning environment was effective in encouraging constructive and collaborative learning, and those students responded positively to this. In particular, they found that students viewed the project as having implications beyond the classroom, to practical uses in the real-world.

This chapter has just focused on some of the potential weaknesses of translating constructivist theory into practice and some of the resulting gaps in the literature, and it has also looked at some existing examples of constructivist learning on the web. We have seen that although constructivism has become a buzzword, there are still some academics whom are unconvinced about constructivist learning, and there is a strong need for more literature addressing the gaps on constructivist learning (Merrill et al., 1996). We have seen that there is a gap in the literature on students' perspectives of constructivism compared to academics and professionals. We have also seen that there is a gap in the literature on the design, development, and evaluation of a fully-online courseware based on constructivism within Higher Education. This research seeks to fill this gap in the literature, by looking at some contemporary perspectives on constructivism, as well as investigating how a learner-friendly courseware may be designed, that effectively utilises constructivist theory into practice.

2.7 Evaluation

A common theme running throughout this chapter is the relevance of evaluation, thus is it is important to address this issue before concluding the chapter. Evaluation is one of the most important phases in the delivery of courseware (Le and Le, 2001). It helps the designer assess whether the courseware has achieved its goals in terms of usability and learning, and helps the designer and develop assess the strengths and potential weaknesses of the courseware. The outcomes of an evaluation may mean that specific aspects of the learning environment may need to be altered, in order for the courseware to be more user-friendly or learner-friendly (Le and Le, 2001). In short, evaluation involves "identifying criteria of merit and worth, setting standards, collecting data, and making value judgements" (Dick and Johnson, 2007, p.96). There is a growing literature base on the evaluation of constructivist-oriented learning environments as part of the classroom environment (Chang and Fisher, 2003; Fisher and Taylor, 1997). Evaluation for online learning however, generally focuses on web-based heuristics which are oriented towards e-commerce guidelines (Nielson and Loranger, 2006), web-based heuristics which take into account teaching and learning (Zaharias 2006a, Zaharias and Poulymenakou, 2006b, Zaharias and Poulymenakou, 2006c), or evaluation which is conducted to find out about students' ability to undertake a course (Le

and Le, 2007b). Evaluation is generally summative, or formative (Dick and Johnson, 2007; Le and Le, 2007b; Stacey and Rice, 2002). Dick and Johnson (2007) point out that summative evaluation takes place after developers have done as much as they can to make sure the instruction is effective, whereas formative evaluation takes place during the development of the instruction. Examples of evaluation may include informal walk-through of the courseware using an expert-based guide, informal walk through of the courseware by an potential user looking for specific strengths and weaknesses of the courseware, formal interviews on specific aspects of the user-friendly or learner-friendly design, or numerical or open-ended questionnaires following the walk-through of the courseware by a potential user. There is a strong need to obtain an evaluation of the user-friendly and learner-friendly components courseware from the point of view of those involved in its use and development, however there is a significant gap in the literature on learners' perspective of contemporary courseware design. As Le and Le (2001) in "Where does the Superhighway Lead Us? A Learner's Perspective", as "students are often the users of Web-based instruction, it is important to understand how the Web is perceived and how Web-based education is valued by them" (p.62).

2.8 Conclusion

This chapter has presented an overview of the literature on courseware design, including a definition of courseware design, a discussion of learning management systems used to develop courseware, and the need to incorporate both user-friendly and learner-friendly aspects of courseware design in order to maintain learner motivation and engagement online. The move from teacher-centered to learner-centered practices was also discussed, in particular, the belief that many academics believe the emergence of the web is heralding a new educational paradigm. The learner-centered methodology is relevant to both the user-friendly and learner-friendly aspects of courseware design. The chapter provided an overview of some of the issues on user-friendly courseware design, in particular the ellipsis in the literature on how user-friendly design impacts upon learning. Whilst there is a well-established literature base on the importance of screen design, aesthetics, navigation and usability aids within general usability design, it is somewhat unclear how learners' and other contemporary participants in the delivery of courseware perceive these elements within an online learning environment. The chapter also presented an overview of learner-friendly courseware design, and introduced us to the two main epistemologies influencing the design of courseware – behaviourism and constructivism. Whilst academics point to a shift from behaviourist instruction to constructivist learning, there is still a gap in the literature on the relevance of behaviourist instruction to contemporary courseware design, how a constructivist-oriented courseware may be designed and developed, and how contemporary participants in online learning view constructivist-oriented courseware. This research seeks to address the gap in the literature, by finding out how a group of contemporary academics,

students, and experts view the user-friendly and learner-friendly aspects of courseware design, and obtaining their opinions on the design of a prototype courseware based on user-friendly constructivist-oriented principles. Hopefully, the results will be bought together to present a better understanding of the user-friendly and learner-friendly aspects of courseware design.

Chapter 3: Research Methodology

3.1 Introduction

The Introduction and Literature Review preceding this chapter have introduced us to the research areas on this thesis. In particular, they have provided an overview of teaching and learning online, user-friendly design, and learner-friendly design. This chapter will now discuss the research methodology utilised by the researcher, in order to provide both a background and a backdrop to the issues on the design of the courseware, and the data analysis which follow this chapter. This research uses a multi-disciplinarian approach, combining instructional design, human computer interface design (usability design) and educational evaluation. The area of courseware design has become more important in the past ten years, with online learning becoming a basic element of teaching and learning in

educational institutions, as well as industrial, commercial and public service contexts (Jochems, van Merrienboer, and Koper, 2004).

3.1.1 The Nature of Instructional Design

It is important to provide a brief background on the nature of instructional design, because this frames the design of courseware. Linguistically, courseware designers are better known as instructional designers. They may also be known as instructional technologists or educational technologists. As Carr-Chellman and Reigeluth (2006) note however, the discipline is young and there is a lack of consistent terminology within the area. This researcher has also found that whilst there is generally a consensus about the process and intention of instructional design, there tends to be a lack of distinction regarding the components of instructional design. In particular, definitions and theories tend stemming from the research in education tend to emphasise the relevance of 'instruction' in educational design, as opposed to 'software design' – including screen design and usability.

Carr-Chellman and Reigeluth (2006) come closest to implying the relevance of the design element of instructional design. They argue that instruction "is anything that is done to purposely facilitate learning", and that design theory is "is aimed at facilitating generative outcomes – that is, it assists in the *creation* of something". Seels and Richey (1994) state: "Instructional Technology is the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning." The Association for Educational Communications and Technology Definition and Terminology Committee (2001) state "Instructional Technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning." Philosophically, the profession of instructional design has been around for as long as paper-based materials have been created for the purpose of education. Nevertheless, instructional design especially for educational software design has only been in existence for around three decades, and instructional designs specially for online learning is still a relatively new concept. Only in the past decades has it become common for universities to deliver web-based learning modules, although it is common for most universities and courses particularly within western universities to provide at least supplementary (optional) online learning modules.

Contemporary instructional design theories tend to centre on philosophical arguments about education theories, as opposed to software design methodologies. This thesis assumes that existing theories of instructional design within education tend to consider software design as the domain of web designers as opposed to instructional design. It is the belief of this researcher however, that the theories and practices of instructional design should come from the areas of educational design, software design, and evaluation of both education and software. The methodological approach taken within this research reflects this belief. This

research involves designing a user-friendly courseware based on constructivist-oriented principles. It entails the researcher taking on the hat of both instructional designer and web developer, and incorporating and amalgamating principles from the disciplines of education, software design, and education/software evaluation. The researcher incorporates both user-friendly and learner-friendly design aspects.

3.1.2 Purpose of This Study

This research seeks to address the gap in the literature, covering courseware design and evaluation for Higher Education utilising the learner-centered principles and features of user-friendly and learner-friendly design. One of the central aims is to investigate some contemporary opinions on courseware design from participants, and to assess whether statistically significant differences of opinion occur according to occupation. For instance, do students, academics, and professionals have statistically significant differences of opinions when it comes to designing specific aspects of courseware, such as the navigation design? Although the focus is on occupational differences between participants within the statistical analysis, the researcher also investigates whether statistical differences occur according to other variables such as age, institution, gender, familiarity with teaching and learning, and computer literacy. A secondary aim of this study is to design a courseware based on the researcher's appropriation of contemporary theory and practices on courseware design. Particular attention is paid to the aesthetics and accessibility features on the user-friendly design, and constructivist-oriented principles on the learner-friendly design. The intention of the researcher was to investigate how a user-friendly and constructivist-oriented design could be developed for a fully-online courseware prototype, and to obtain an evaluation of the prototype from students, academics, and professional designers/developers. There are two sources of data collected as part of this research. The first source of data included 246 responses to the questionnaires on participants' views regarding the features of courseware design. The second source of data stemmed from the courseware evaluations. This included data from a total of ten face-to-face interviews with participants from universities (mainly the University of Tasmania) and professionals (from professional training organisations in Melbourne), and also seven email replies from the web-based feedback of those whom evaluated the courseware over the World Wide Web.

3.2 Research Aims and Objectives

The main aim of this study is to investigate the perspectives of user-friendly and learner-friendly aspects of courseware design for Higher Education, from a range of participants who may be involved either in its production or as learners. This study examines the perspectives of academics and professional instructional design experts on courseware design for teaching and learning online, and to compare this in particular to tertiary learners' perspectives. The study is interested specifically in whether statistically significant

differences of opinion occur between participants according primarily to their occupation, but also to other relevant areas such as age, institution, gender, familiarity with teaching and learning online, and computer literacy. Nevertheless, an aim of this research is to utilise a mixed-methods approach to data collection and analysis, in order to increase the chances of a more comprehensive understanding on learners' perspectives of contemporary courseware design.

Thus, the researcher intends on using a range of both quantitative and qualitative methodologies and tools. This includes a questionnaire with numerical and open-ended data, and courseware evaluation data from both semi-structured interviews and email feedback. The questionnaire includes 29 questions, all of which fit into pre-defined sub-themes on teaching and learning online, user-friendly design and learner-friendly design. The aim of the open-ended component is to hopefully obtain a better understanding on the pre-existing sub-themes, and to obtain information on emerging sub-themes that the statistical component alone cannot provide. A major aspect of this research is to design an example courseware for an undergraduate course on Intercultural Communication, based on the features and principles of user-friendly and learner-friendly design. The researcher then intends to obtain open-ended qualitative feedback about the courseware design from instructional design experts, and academics and learners' in Education and Other Disciplines. The ultimate goal is to hopefully obtain a greater understanding of the role of specific features of the user-friendly and learner-friendly aspects of courseware design, which may potentially strengthen or limit the chances for effective teaching and learning online to occur.

3.3 Statement of the Problem

Leedy and Ormrod (2005) believe that "The problem is the axis around which the whole research effort revolves. The statement of the problem must first be expressed with the utmost precision; it should then be divided into more manageable subproblems. Such an approach clarifies the goals and directions of the entire research effort" (p.43). This research is an investigation of experts in instructional design and academics and tertiary learners' in education and other disciplines, attitudes towards web based courseware for teaching and learning. In particular, their evaluation of an example courseware for a first year undergraduate course, built on the principles of user-friendly and learner-friendly design.

This study has the following objectives:

Objective 1:

To investigate the attitudes and views of university students, academics, and professionals on courseware design as part of teaching and learning online in contemporary Higher Education.

Objective 2

To examine the significance of user-friendly design for effective courseware design within Higher Education, and investigate the attitudes and views of university students, academics, and professionals on the features of user-friendly design.

Objective 3

To examine the concept 'learner-friendly' design and its relevance to effective courseware design within Higher Education, and investigate the attitudes and views of university students, academics, and professionals on the features of learner-friendly design.

Objective 4

To critically examine the role of behaviourist and constructivist philosophies in contemporary courseware design for Higher Education, and investigate the attitudes and views of university students, academics, and professionals on designs based on these philosophies.

Objective 5

Construct an undergraduate fully-online courseware prototype for a first year university course based on the example topic Intercultural Communication. Design and document the prototype to reflect the current literature and practices surrounding effective user-friendly and learner-friendly design. Design a user-friendly courseware based predominately on constructivist philosophies. Invite students, academics, and professionals to evaluate the courseware, and present a range of perspectives surrounding the user-friendly and learner-friendly design.

3.4 Research Assumptions

Leedy and Ormrod (2005) state "an assumption is condition that is taken for granted, without which the research project would be pointless … careful researchers state their assumptions, so that others inspecting the research may evaluate it in according with their *own* assumptions…it is better to be overly explicit than take too much for granted." (p.5). Assumptions are that, which the researcher takes for granted about the research problem. As Leedy and Ormrod also comment "Assumptions are so basic that, without them, the research problem itself couldn't exist … Without these assumptions, we have no problem, no research" (56-57). Thus, the assumptions of this research are as follows:

- Participants of the questionnaire and courseware evaluation are drawn from a broad group including professionals, academics and students in Education and Other Disciplines. They are proficient at reading and writing general English, and they may or may not be computer literate or have experience with using courseware as part of teaching and learning online.
- The purpose of the interview will be to obtain feedback about learner-friendly and user-friendly design aspects of the courseware, as opposed to a review of the content of the courseware.

- The courseware follows principles of user-friendly design as it applies at the time of this research. The researcher assumes that it is designed for current software and hardware configurations, and is accessible across different browsers and platforms, and each page displays consistently in regards to screen width and layout. The courseware is not intended as a pre-emptive example of the future standards of user-friendly design, although it is anticipates that an outcome of this research will be information that may contribute to the development of these standards.
- Once the courseware is 'live' (online), participants of the interview and members of professional education and IT listservs will be notified, so the researcher assumes that they may access the courseware 'anytime' and 'anyplace'.
- Participants of the interview are encouraged to familiarise themselves with the courseware before the interview, however it assumed this may not always be possible. They may also post the researcher any thoughts relating to the courseware after the interview, via the courseware website. Thus it is assumed that they may have access to the World Wide Web in order to contact the researcher.
- Members of professional Education and IT listservs will be briefed on the design and purpose of the courseware, and encouraged to send the researcher constructive criticism or otherwise about the design features of the courseware, via the courseware website. It is assumed that the courseware's collaborative tools (email function or discussion board) will enable the participants to contact the researcher effectively.
- It is an assumption of this study that participants' level of computer literacy is somewhat similar, despite their opinions regarding whether they have beginner, intermediate, or high levels of computer literacy.

3.5 Research Limitations

This research does not intend to investigate the values of face-to-face versus online learning, however it does intend to obtain information via the questionnaire on whether online participation increases the research respondent's motivation more than face-to-face participation, and whether courseware should be used in addition to face-to-face training. The majority of the participants from Higher Education came from the University of Tasmania, due to their convenience of access. Thus the research cannot be generalised as an evaluation of feedback from a comprehensive list of universities across Australia, although it would have been ideal to obtain more information from a broader spectrum of universities. All the questionnaire respondents from the professional group came from professional training providers in Melbourne, whom the researcher had previously been in contact with during her experience as a professional instructional designer. Thus the research cannot be generalised as an evaluation of feedback from a comprehensive list of professional training providers across Australia, although again it would have been ideal to obtain more information from a broader spectrum of professional training providers. The

development of the prototype courseware was undertaken by the researcher due to limitations on time and cost, and because she considered it more realistic to develop it herself due to the increased possibility that academics would often solely be involved in the process of instructional design, subject matter expertise, and web development within a real world setting.

Although the researcher undertook ongoing informal evaluation of the prototype, it is possible that the courseware is not presented as professionally as it would be if a professional web developer had been involved. This research intends to obtain an evaluation of a prototype courseware specifically designed for this study. Therefore, the evaluation is only of the prototype courseware as it may be used, and not as it is used in a real-world situation as part of an active course within Higher Education. It would have been excellent to obtain a summative evaluation of the courseware as students use it in the real-world, however this was not possible. Finally, it should be pointed out here, that the researcher before the study undertook a pilot study of the questionnaire design, in order to assess the effectiveness of its design. The questionnaire was also submitted to a formal ethics committee for analysis, and subsequent alterations were made based on their recommendations. Thus the researcher recognises that any limitations with the design of the questionnaire are wholly her responsibility.

3.6 Courseware Evaluation

3.6.1 Development of the Courseware

The premise of this research is that there is consensus about the principles and features of user-friendly design, however ongoing research and development in the field continues to expand our understanding of the discipline. For example, Neilson and Loranger's book *Prioritizing Web Usability* released in 2006 emphasise that one of the goals of the book is to update their web usability guidelines from the 1990s to reflect their findings since 2000. For example, they found that the guidelines they developed from the 1990s does not tend to hold up as well as those done since 2000. Their reasoning is that some of their early usability findings do continue to hold true today because the fundamental interactions on the Web haven't changed so much, nor do people's cognitive abilities. On the other hand, designers, users and technology have all changed, and this has impacted on usability guidelines. One of the focuses of this research is user-friendly design as it applies to learning, which is a relatively new area. Specifically the role of aesthetics, and usability to learner understanding and motivation in using the courseware. This research attempts to utilise the principles of user-friendly design as they apply at the time of her research.

The courseware used has been designed and developed by the researcher, using the web design tool *Dreamweaver*, and graphic design tool *Photoshop*. Again, it would have been preferable that a professional web development and graphic design team develop the courseware design, however the cost for this extends beyond the budget of the researcher. The researcher assumes that the courseware is user-friendly, however there are two reasons why there may still be usability issues remaining with the end design. Firstly, a non-professional web developer is not able to translate design intentions to the web based form, as well as a professional web developer could. Secondly, the nature of usability testing methodologies – such as 'scenarios' and 'walk-throughs' are aimed at understanding usability issues in-depth. Ultimately, it would have been preferable to undertake thorough usability testing before the interview process, however the researcher decided against this as the intentions of existing usability testing methods and the open-ended interview regarding the courseware differ. For example usability testing involves understanding specific design faults with the web interface, whereas the focus of the interview is to understand design issues as they apply specifically to learning. There is opportunity however, for participants to comment upon any design faults that they have come across. Also, although ongoing informal user-testing has been undertaken, in-depth usability-testing would have added significant stress upon the researchers' time and resources in regards to the software development lifecycle. Again, it is anticipated that participants will speak up in the interview, about any major flaws they have found with the user-friendly design.

3.6.2 Delivery of Courseware

As mentioned in the limitations on this research, the design of the courseware is only intended as a prototype, and thus it is not possible to obtain ongoing evaluation as the courseware is being used either as part of a course, or when the course is finished. Ongoing and post evaluation of the courseware would have added greatly to our understanding of the success of the design methodology used for the courseware, however the delivery of courseware really extends beyond the scope of this research. The researcher decided against utilising a Learning Management System in this courseware for several reasons. Firstly, there is debate about whether LMS can discourage constructivist-based learning. Secondly, the utilisation of a LMS may encourage participants to comment on the effectiveness of the specific LMS, and take the focus away from the actual design methodology used in the courseware. As a result however, the researcher did not program a working collaborative discussion board or chatroom, and the games-based activities were developed. Rather, the prototype included a description of the collaborative tools and activities, as they would be developed. This may impact upon feedback regarding the perceived merit of these features by the interview participants. On the other hand, it was possible for participants' to contact the researcher using the feedback discussion board or the contact email form via the courseware. More about the software engineering method will

be provided later in this chapter. More information about the courseware design will be presented in the next chapter.

3.7 Research Design

A research methodology is one of the keys to the success of the research project. It helps ensure that the research itself is valid, and the methodology used s appropriate (Meyers, 2008). In *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* Creswell (2003) conceptualises three elements of enquiry: what knowledge claims are being made by the researcher (including a theoretical perspective); what strategies of inquiry will inform procedures; and what methods of data collection and analysis will be used. Creswell believes these elements combine to form the different approaches to research. That is, qualitative, quantitative or mixed methods. This data utilises a mixed-methods approach, by combining both quantitative data (numerical information from the questionnaire), and qualitative data (open-ended information from the questionnaire and courseware evaluation). Both forms of information are combined to increase the potential for a more in-depth understanding on participants' perspectives of courseware design. The numerical questionnaire data was divided deductively into pre-defined sub-themes on teaching and learning online, user-friendly design, and learner-friendly design. The thesis utilised a Grounded Research Methodology to inductively divide the open-ended questionnaire data into sub-themes. Many of these sub-themes corroborated with those from the quantitative data, and provided some insights behind the findings from the questionnaire. Other emerging sub-themes provided a perspective that the numerical data alone cannot provide. The open-ended data from the courseware evaluation provided more information on user-friendly and learner-friendly design, as it applied to an example in practice. Altogether this data attempts to provide a more in-depth perspective to courseware design, than a quantitative or qualitative approach alone would.

Constructivist knowledge claims, that there are multiple ways to understand and interpret a phenomenon, and that each reflect a different but equally important reality or 'individual experience'. The literature tends to align research based on a constructivist epistemology with purely qualitative approaches. On the other hand, it could be argued that the traditional positivist-scientific approach that tend to be utilised by quantitative strategies, provide another valid version of 'reality' for the constructivist to consider when analysis the research. This research aligns itself with pragmatist knowledge claims, which is the philosophical underpinning of the mixed methods approach. Cresswell (2005) notes that Tashakkori and Teddie (1998) and Patton (1990) argue that the pragmatist convey the importance for focusing on the research problem, and then using pluralistic approaches to derive knowledge about the problem. Creswell then notes that researchers Cherryholmes (1992) and Murphy (1990) and his own interpretations of their research, believe that pragmatism is not

committed to any one system of philosophy and reality, that truth is what works at the time – and not a strict duality between mind and reality independent of the mind. So, "for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis" (p.12).

This research utilises the mixed-methods approach in order to enable a broader understanding of the research problem. As Bruce Berg (2007) states, by "combining several lines of sight, researchers obtain a better, more substantial picture of reality; a richer more complete array of symbols and theoretical concepts; and a means of verifying many of these elements". This research also involves software engineering, it seeks to apply existing theory and practices to the courseware design as part of the design process, and to evaluate the success of the design according to representatives of each participant group. In order to better understand learners' perceptions of the features of courseware, an external questionnaire will be delivered to a large participant group. It is anticipated that an analysis of these multiple 'lines of sight', will better enable the researchers to gain a more sophisticated understanding of the complex issues on the research problem and its objectives. In line with the researchers' constructivist epistemology however, it is recognized that the analysis and conclusion drawn from the data collected is a construction of the researcher as a result of her subjectivity in examination of the data. Whilst it is inevitable that other researchers may interpret the same findings in a different light, it is anticipated that the vigour of the mixed-methods approach to collecting and interpreting the data strongly contributes to its validity and integrity. More about the quantitative and qualitative approaches will be provided in both sections 3.9 and sections 3.10 of this thesis, and within the Quantitative Analysis and Qualitative Analysis chapters.

3.8 Software Engineering Approach

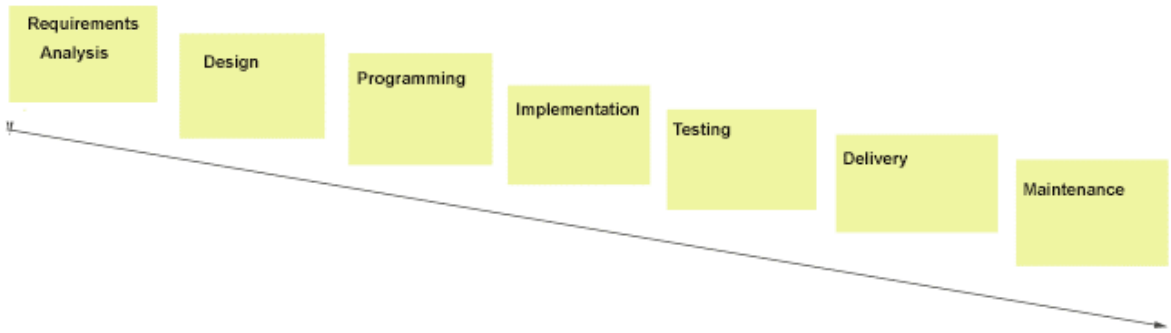
Computer expert Shari Phleeger (2001) in *Software Engineering: Theory and Practice* believes software engineers use their "knowledge of computers and computing to help solve problems" (p.2). Software engineering usually includes the following components:

- Analysis of the software requirements,
- Design of the software,
- Programming of the design
- Implementation of the software program,
- Testing of the software,
- Delivery of the software to the end-user/client, and
- Maintenance of the software.

The traditional software engineering process includes the waterfall model, in which each phase of the software development process is completed before the next begins. So, the

analysis of the requirements is required, before the design can be take place, and so on. This can be depicted as follows:

Figure 3.8 Software Engineering Process: Waterfall Model



The main problem with the waterfall model, is that critics recognise it doesn't necessarily reflect the software development process in reality. Pflleeger (2001) quotes Curtis, Krasner, Shen, and Iscoe (1987) whom note that the major shortcoming of this model is its failure to treat software as a problem-solving process. That is, that this model tells us very little about that back-and-forth activities between each component, throughout the software engineering lifecycle (p.50). As Jared Spool et al. (1998) note, it is a myth that software developers can get it right the first time. Furthermore, evaluation or 'testing' of the software is undertaken just before delivery, which means that there is little scope to correct any major flaws in the design – if they do exist. In actuality, many software developers develop a prototype or 'model' of the software design – in this case web-based courseware. This enables the software project team to evaluate the design, and enhance the usability of the end-product (McCracken and Wolfe, 2004). Prototyping is an important element of the user-centered software development methodology. This methodology involves the users – in this case the learners, in the process of designing the software as much as possible throughout its design, draws on knowledge from multiple disciplines, and is highly iterative. That is, it entails as much testing and redesign of the interface as possible (McCracken and Wolfe, 2004). A potential drawback here is that this model can become time-consuming and expensive if there are too many redesigns before implementation.

This research utilised a more user-centered approach to the software engineering process. The first prototype was a 'low-fidelity' design, using paper and pen. This was edited over a significant period of time, according to the researchers' ongoing analysis of the literature in the field and contemporary practices, informal evaluation by non-participants of the research, and development of the researchers' argument throughout her research leading to the web-based development of the prototype. The prototype evaluated by participants is what McCracken and Wolfe (2004) call a 'global' prototype. The state "a *global* prototype has breadth and depth. It is a prototype of the entire site, and gives users an opportunity to get a good appreciation of the look and feel of the entire site" (p.126). Whilst all of the features of the courseware are shown, they're not all fully functional.

3.9 Quantitative Research Approach

Both quantitative and qualitative research is considered valid methods in educational research, and researchers recognise that both these approaches can be complementary. As discussed in the Research Design component of this chapter, this research utilises both methodologies in order to obtain a broader range of perspectives on courseware design. This component of the research discusses the quantitative part of the study in more detail. Quantitative research in education entails specific questions, collecting numeric information from participants, analysing these statistics, and conducting the research in an objective manner (Cresswell, 2005). Thus, in quantitative research the process of research is essentially deductive, where the researcher starts with a set of pre-conceived themes, and utilises tools such as questionnaires to undertake statistical analysis, in order to test specific questions relating to these themes. Here, theories are 'deduced' from pre-existing assumptions existing in the research.

The quantitative tool utilised within this research was a questionnaire, which collected: participants' background details; numerical feedback on pre-defined areas of teaching and learning online, user-friendly design and learner-friendly design; and behaviourist and constructivist-oriented designs; and two open-ended questions which enabled the participants to provide information about their perceptions courseware design in their own words. The researcher utilised SPSS statistical software to analyse the numerical data from the questionnaire, and find out whether statistically significant differences of opinion occur between participants' according to their backgrounds (occupation, age, institution, gender, familiarity with teaching and learning online, and computer literacy. More information about the statistical analysis will be discussed in the Quantitative Analysis chapter. The purpose of this section is to discuss the data collection, questionnaire, participants, and validity and reliability of the quantitative component of this study.

3.9.1 Questionnaire data collection

The questionnaire seeks to obtain data on participant perspectives regarding specific aspects of teaching and learning online. It is designed to be in three sections. Firstly, biographical information on the participants, as it is assumed that this may affect the way the next two sections are answered. Secondly, 29 set research questions targeting specific aspects of online learning, and user-friendly and learner-friendly design. This section utilises the Likert scale, in which participants rate each questions based on numerical data. That is, 1 if they strongly agree, 2 if they agree, 3 if they're not sure, 4 if they disagree, and 5 if they strongly disagree. Burns (1994) believes that the main strengths of the quantitative approach is its precision and control; precision through the sampling, and control through reliable measurement. The last section of the questionnaire includes two open-ended short answer questions, which enable participants a space to state which features of courseware they

would like to see, and/or particularly dislike the most. The objective behind the questionnaire design is to enhance the possibilities for gathering a broader range of data for overall analysis of the research problem and sub-problems. More information about each of the three questionnaire sections and the rationale behind their design (Part A to Part C) is detailed below:

Part A: Biographical information of participants

This section includes six questions:

- Age: to identify whether age affects participant feedback,
- Occupation: to classify which of the five groups the participant belongs to,
- Institution: to classify whether the type of institution attended affects participant feedback,
- Gender: to determine whether gender affects participant feedback,
- Familiarity with online teaching and learning: to find out whether online expertise effects participant feedback, and
- Level of computer literacy: to determine whether computing expertise affects participant feedback.

Part B: 29 Numerical Questions

This section includes 29 questions, each aligning to one of the research objectives and sub-problems. The relevant research objective and their related themes and sub-themes are listed below, along with the questions from the questionnaire that align to these.

Objective 1:

Theme: Teaching and Learning Online

Sub-Theme 1: Online Versus Face-to-Face (Rational: to obtain information on participants' perspectives of their motivation on online versus face-to-face learning)

Numerical Questions:

Q.18 Online chat is an effective alternative to face-to-face learning.

Q.27 Online participation increases my motivation more than face-to-face participation.

Q.29 Courseware should be used in addition to face-to-face interaction.

Objective 2:

Theme: User-friendly Design

Sub-Theme 2: Navigation (Rational: to obtain information from participants on the design of navigation in courseware, in particular open-ended versus direct navigation)

Numerical Questions:

Q.5 An open-ended learning environment should be present in courseware.

Q.7 Direct instructional guidance to using the courseware is essential

Q.20 Learners' should be given clear navigational directions when using the courseware).

Sub-Theme 3: Screen Design and Layout (Rationale: to investigate the importance of screen design and layout to usability, and the role of aesthetics to learner motivation within courseware)

Numerical Questions:

Q.21 Courseware should utilise effective usability, e.g. clear navigation and good screen design, help menu.

Q.24 Attractive screen design enhances my motivation to learn.

Q.25 Screen design and layout affects my ability to use the courseware.

Objective 3

Theme: Learner-Friendly Design

Sub-Theme 4: Learner Consultation (Rationale: to obtain information on the role of learner consultation in courseware)

Numerical Questions:

Q.1 Learners should be consulted in courseware development.

Q.12 Learners should actively participate in developing course e-learning outcomes.

Sub-Theme 5: Learner-Styles (Rationale: to obtain information on whether courseware should address different learning styles)

Numerical Questions:

Q.3 Courseware should accommodate different learning styles.

Q.4 Courseware should contain a range of mixed modes, e.g. text, graphics, video and sound.

Sub-Theme 6: Learner Design Features (Rationale: to obtain information on participants' perspectives of educational philosophies, independent learning, flexibility, resources, and self-tests in courseware)

Numerical Questions:

Q.2 Courseware should be based on educational philosophies or principles.

Q.9 Learners should be encouraged to be independent learners in using courseware.

Q.22 Courseware should be flexible to learners.

Q.23 Courseware should provide useful resources for learning.

Q.26 Courseware should include self-tests for learners.

Objective 4:

Theme: Behaviourist and Constructivist-oriented Designs

Sub-Theme 7: Direct Instruction (Rationale: to obtain information on the relevance of direct instructional guidance to enabling effective learning)

Numerical Questions:

Q.7 Direct instructional guidance to using the courseware is essential.

Q.8 A lack of instructional guidance decreases my motivation to use the courseware.

Sub-Theme 8: Open-ended (Rationale: to obtain information on participants' perspectives of open-ended designs compared to a high level of instruction)

Numerical Questions:

Q.5 An open-ended learning environment should be present in a courseware.

Q.6 A teacher-controlled learning environment with a high level of Instructional guidance can be useful in a courseware.

Sub-Theme 9: Recall and Memorisation (Rationale: to assess how participants' perceive behaviourist-oriented strategies)

Numerical Questions:

Q.15 Multiple-choice answers that entail a right or wrong answer are effective learning strategies.

Q.16 The course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings.

Sub-Theme 10: Learner Objectives (Rationale: to assess whether participants are supportive of co-developing course learning outcomes)

Numerical Questions:

Q.10 My motivation to learn is enhanced if I know precisely what the learning outcomes are.

Q.12 Learners should actively participate in developing the course learning outcomes.

Sub-Theme: Real World Learning for Higher Order Thinking (Rationale: to assess whether participants support constructivist-oriented designs)

Q.11 Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic.

Q.13 Courseware should encourage problem-solving and embed learning in real-world examples.

Q.14 Information about a specific problem should be learnt within the context of that problem.

Sub-Theme: Multiple-Choice (Rationale: to look at how participants perceive the use of multiple-choice questions within courseware)

Numerical Questions:

Q.15 Multiple-choice answers that entail a right or wrong answer are effective learning strategies.

Q.28 Well-designed multiple-choice can be an effective assessment tool.

Sub-Theme: Collaboration (Rationale: to look at the importance of collaborating for learning, and in particular using discussion boards to problem-solve)

Q.17 Discussion boards are an effective problem-solving tool.

Q.19 Collaborating with other learners enhances learning.

Part C: Open-ended Section

This section includes two open-ended short-answer questions: what feature(s) of courseware would you like to see?; and what feature(s) of courseware do you dislike the most? Depending on the nature of the feedback provided – if any, responses could align to objective two, three, four or five. Potentially, responses can relate to more than one objective.

3.9.2 Participants

The researcher recognised a gap in the literature on the perspectives of students compared to academics and professionals, when it came to the design of courseware. In particular, the literature and practices, which tend to focus on learner-centered methodologies appear to be somewhat lacking in regards to students perceptions of learning design. The researcher thus sought to obtain feedback from six different participant groups:

1. Academics in Education (employed within the School of Education),
2. Academics in Other Disciplines (all other disciplines outside of Education),
3. University students in Education (studying within the School of Education),
4. University students in Other Disciplines,(all other disciplines outside of Education)
5. eLearning Professional – Instructional Designer (employed as an ID within Higher Education, government or commercial education), and
6. eLearning Professional – Web Developer (employed within Higher Education, government or commercial education).

The purpose in including six participant groups, is to better understand whether there are any differences in perceptions regarding specific aspects of teaching and learning online, between academics and students in Education and Other Disciplines, academics and eLearning professionals, students and eLearning professionals, academics and web developers, students and web developers, and instructional designers and web developers.

3.9.3 Procedure

Once the research questions had been determined and the information sheet and questionnaire designed, it was sent to the Ethics Committee for approval. Upon approval the researcher emailed an invitation to academic staff from the Faculty of Education and other disciplines mainly at the University of Tasmania, to invite them, their colleagues and their students to participate in the study. The researcher met with interested academic staff members in person, to discuss the possibility for the researcher to personally invite their students to participate in the study. If staff had been obliging and the researcher could arrange face-to-face meeting, then she attended the class usually toward the end of the lecture so students weren't distracted. In all cases, the staff member allowed at least 10 minutes of class time to help ensure the reliability of the data. The researcher was introduced to the class, and students were invited to take part in the study. They were provided with two

information sheets – one inviting them to participate in the questionnaire immediately and the other inviting them to participate in the interview, several months later.

Academic staff that were interested in participating in the research, but for various reasons were not able to enable me to invite students to participate, were emailed, posted or handed the information sheet and questionnaire in person. The questionnaires were returned via email, pre-paid envelopes, internal mail or face-to-face to the researcher. Academics and students outside of the University of Tasmania, were generally notified of the research through existing participants. ELearning professionals from three commercial training organisations in Melbourne were invited to participate in the research via email. If interested, they were posted the questionnaire information sheet, questionnaire itself, an invitation to participate in the interview, and a pre-paid envelope. Of the questionnaires 376 were handed out in total – 143 to students in Education, 176 to students in other disciplines, 43 to academics in Education and other disciplines, and 14 to eLearning professionals. Of these 243 were received in total: 193 from students - 102 in Education and 91 from other disciplines; 36 from academics: 24 in Education and 11 from other disciplines; and, 14 from eLearning professionals: 10 instructional designers and 4 web developers.

3.9.4 Validity and Reliability

Questions were purposely and consistently arranged, so as to enhance the research validity. Sometimes multiple questions relating to the same topic with opposing views were placed next to each other. For example, question seven (Q.7 direct instructional guidance to using the courseware is essential) was placed next to question eight (Q.8 a lack of instructional guidance decreases my motivation to use the courseware). If the same participant indicated conflicting information such as ‘strongly agree’ for question seven, and ‘strongly disagree’ for question eight, this could point to an issue with the validity of the research. There were four ways in which this research attempted to enhance the validity and reliability of the study. Firstly, each questions indicated one construct/idea. For question one focused specifically on learner consultation (Q.1 Learners should be consulted in courseware development). Secondly, each question was very specific and attempted to measure the most precise measurement possible. For instance question twenty-six asked a very specific question relating to the use of self-tests in courseware delivery (Q.26 Courseware should include self test for learners, asks a specific question about the use of self-tests in courseware delivery). More than one indicator of a variable was often used, as ‘two more indicators are better than one’ and provide empirical evidence of the levels of a variable. For example, within the sub-theme of screen design and layout question 21 (Q.21 Courseware should utilise effective usability, e.g. clear navigation and good screen design, help menu) and question twenty five (Q.25 Screen design and layout affects my ability to use the courseware) both look at the whether screen design effect usability within courseware. Finally, to enhance the validity and

reliability of the research, pilot test of the first draft of the questionnaire was undertaken before the researcher settled on a second draft. That is, the researcher tested the questions with the researcher's supervisor and a small group of participants, and completed a second draft before sending the final questionnaire to the ethics committee. A third draft was required by ethics, before the final questionnaire was complete.

3.10 Qualitative Research Approach

Qualitative research is a type of educational research in which the researcher relies on the views of participants, asks broad general questions, collects data consisting largely of words (or text) from participants, describes and analyses these words for themes, and conducts inquiry in a subjective, and a biased manner (Cresswell, 2005). The qualitative research approach enables the researcher to better understand and contextualise the problem from the point of view of the participant. It includes interviews, case studies, and ethnographies – just to name a few examples. Burns (1994) recognises that quantitative research methods can produce findings of little consequence, because it tends to generalize findings rather than take account of peoples' ability to individually interpret their own meanings. So, what is true for one participant when evaluating a specific aspect of courseware may not be true for another participant. The mixed methods approach of utilising both quantitative and qualitative approaches to the research methodology attempts to address this potential deficiency. The qualitative data utilised in this research includes information from the open-ended questionnaire data, and the courseware evaluation data – which included both interview and web-based feedback).

Whilst the quantitative methodology utilises a deductive process to pre-define sub-themes and address pre-defined sub-problems, the qualitative methodology utilises a primarily inductive process. A Grounded Theory Methodology was utilised to discover emerging sub-themes and issues that arose from the qualitative data. When it came to the questionnaire data there were some pre-existing themes that were addressed, and further insights provided behind the findings of the statistical results were discovered. In other cases new sub-themes emerged, and provided another perspective on teaching and learning online, user-friendly design or learner-friendly design, which the statistical analysis alone did not provided. Furthermore, the courseware evaluation was also analysed according to a Grounded Theory Methodology. Again, some of the same sub-themes from the questionnaire data arose, whilst other emerged. In all cases new insights and perspectives developed on courseware design and development, which the questionnaire data alone does not address. More information about the qualitative analysis is provided in the Quantitative Analysis chapter.

3.10.1 Interview

Interviewing allows for in-depth probing of attitudes and experience relating to participants use of the software (Paas and Firssova, 2004). Proponent of interviewing Irvine Seidman (1998) believes that it provides access to the context of people's behaviour and thereby provides a way for researchers to understand the meaning of that behaviour. That is, "Interviewing allows us to put behaviour in context and provides access to understanding their action" (p.4). Obtaining the rational behind academic, student and professional's interpretation of the courseware, greatly assists in understanding how specific aspects of learner-friendly and user-friendly design contribute (or otherwise) to enhanced learning online.

Seidman (1998) lists techniques that should aid in successful interviews, which the researcher attempted to follow, in order to maximise the potential for a more in-depth analysis of the courseware evaluation from participants:

- Listen more, talk less,
- Follow up on what the participant says,
- Ask questions when you do not understand,
- Ask to hear more about a subject,
- Explore, does not probe (too little exploration can leave an interviewer unsure of the participant's meaning in the material he/she has gathered),
- Listen more, talk less, and ask real questions (i.e. one which the interviewer doesn't already know or anticipate the response),
- Avoid leading questions (one that influences the direction the response will take),
- Ask open-ended questions (establishes territory, and allows participant to take any direction he/she wants),
- Follow up, does not interrupt,
- Ask the participants to talk to you as if they were somebody else,
- Keep participants focused and ask for concrete details,
- Share experiences on occasion,
- Ask participants to reconstruct, not to remember,
- Avoid reinforcing your participant's response,
- Explore laughter,
- Follow up your hunches,
- Use an interview guide cautiously, and
- Tolerate silence.

The interview included nine open-ended questions, one before the demonstration of the courseware and the rest immediately preceding the demonstration. It is anticipated that these questions may contribute to a greater understanding of issues associated with the

implementation of specific features of learner-friendly and user-friendly design. The starting interview questions are as follows, these were adapted according to the ebb and flow of the interview:

Pre courseware demo:

Definition of Courseware

1. What does the term courseware mean to you?

Post courseware demo:

User-friendly Design

2. In your opinions does this courseware provided user-friendly design? Is it relatively easy to use?
3. Usability features of courseware are not always considered. What usability features would best help you learn?
4. The visual design of courseware is not often always considered. What do you think of the visual design?

Learner-friendly Design

5. What do you think of the amount of instructional guidance? Is it too clear, too much, too little, too vague?
6. What do you think of independent learning? Do you think this courseware can encourage this?
7. Courseware design often just gives notes, courseware should encourage people to think deeper. Do you think the courseware does this to some extent?

User-friendly and Learner-friendly Design

8. When you look at the courseware what appeals to you? What do you think is good, and what do you think needs improvement?

Question nine provided the opportunity for learners to state in their own words, any preconceived strengths or weaknesses that the courseware may have according to them. This enabled the researcher to obtain information on the courseware design, which the questionnaire and courseware evaluation hadn't thus far obtained.

3.10.2 Participants and the Process

There were ten interview participants, and each of the groups above were represented. In some cases a single participant bridged more than one participant group. For example, one participant was an academic from Other Disciplines (information systems) and a professional web developer. Another participant was a university student from Education, and a professional instructional designer within the secondary education sector. More information about the participants is provided in the Qualitative Analysis chapter. As mentioned above, participants were invited to take part in the interview via email or face-to-face. The letter of invitation instructed participants that the interview would take approximately 30 minutes, not including 15 minutes preparation time. Interested participants were emailed information

sheets, and appointments were booked according to their availability. The interview took place at a time and location convenient to the participant. Prior to the interview, participants were emailed the URL of the courseware and asked to familiarise themselves with the courseware, and to feel free to come to the interview with any design issues that they notice in particular. During the interview participants were instructed that there was no right or wrong answer, and briefed on the interview structure. They were also given a 10 minute demonstration of the courseware, to (re)familiarise themselves with its features. Furthermore, it was emphasised that the courseware is a prototype, and the purpose of the interview is not to obtain a critique of the content, rather feedback on specific aspects of the learning and interface design. The researcher used her laptop to demonstrate the courseware offline.

3.10.3 Web Based Feedback

An invitation was emailed to four educational research listservs, inviting members to view the courseware and email the researcher feedback regarding its strengths and weaknesses. Each of these groups were chosen due to the range and scope of their audience. That is, the groups were purposely oriented towards eLearning design, thus it was anticipated by the researcher that respondents would have experience and an interest in providing relevant feedback on the courseware evaluation. These listservs included:

- IFETS (international forum for educational technology and society, for academics and professional instructional designers),
- ITFORUM (international instructional technology forum, for academics and professional instructional designers),
- UTAS_education (Yahoo Group mainly for postgraduate researchers at the University of Tasmania), and
- Tas-IT Yahoo Group (Yahoo Group for Tasmanian educators interested in IT).

3.10.4 Validity and Reliability

The validity and reliability of the interview may be compromised in two ways. Firstly, if the participant is not given an opportunity to adequately construct and communicate their own meaning (Siedman, 1998). This research utilised the interviewing techniques listed above, to help ensure this does not happen. Secondly, if participants do not take the time to familiarise themselves with the courseware prior to the interview, they may suffer cognitive overload and their feedback may not be as comprehensive had they been familiar with the courseware. The validity and reliability of the web-based discussion is negatively affected if the participant does not take the time to read the splash page, which contextualises the purpose of the courseware, its target audience, and its design features. To help protect against this, the researcher informs the listserv members of these issues, before including the URL of the courseware.

3.11 Ethical Considerations

The integrity of the research relies on a strong approach to the way in which participants are dealt with. The anonymity and confidentiality of participants are maintained in the questionnaire, as there is no way in which participants may be physically identified. Before starting the interview, participants sign a statement of informed consent, which assures that their identity will remain private. They also have the opportunity to withdraw from the interview at any time, should they wish to. Lastly, an email is sent to the listserv, notifying potential participants they any feedback may be used as part of the research, however they will not be identifiable in any way. This information is replicated on the splash information page of the courseware.

3.12 Conclusion

Research is a system of investigation to find answers to a problem (Burns, 1994). Good academic research relies upon a strong data methodology to frame the research problem, and seeks to answer their sub-problems whilst maintaining a strong consideration of the validity, reliability and ethics of the approach utilised. This chapter has discussed the research methodology that will be utilised within this research. It has provided details on the quantitative and qualitative tools utilised by the researcher, and the rationale behind the use of these tools. The following chapter will detail the courseware design, whilst the next two chapters will discuss the analysis of the qualitative and quantitative data, based on the questionnaire and the courseware evaluation data.

Chapter 4: Courseware Design

4.1 Introduction

Thus far we have covered the Introduction and Literature Review chapters. These gave us an overview of the issues this thesis deals with, and the existing research framing the area of courseware design for teaching and learning online. The preceding Research Methodology chapter covered mixed-methods research methodology utilised within this thesis, including both quantitative and qualitative modes of data collection. The qualitative mode of data collection included an evaluation of a prototype courseware, on the example topic Intercultural Communication. This chapter covers the design of the courseware, and it is divided into two main parts. The first part of this chapter includes a brief discussion of some of the literature and ideas that framed the design of the courseware. The second part of this thesis provides an overview of the main screens in the prototype courseware developed for this research, and a discussion of these screens. A particular focus will be given to the user-friendly and learner-friendly aspects of design, as they pertain to effective teaching and learning online. As Karen Swan (2003) says:

> "The goal, the raison d^etre, the stuff of education is learning. Thus, learning effectiveness must be the first measure by which online education is judged. If we can't learn as well online as we can in traditional classrooms, then online education itself is suspect, and other clearly critical issues, such as access, student and faculty satisfaction, and (dare we say it) cost effectiveness are largely irrelevant." *(*p.14).

In this vein, the aim of this research is to design and evaluate a prototype courseware, in order to gain further insights into its effectiveness. The aim is not to evaluate whether online education is better than face-to-face to education, or vice versa, although this research's line of inquiry may uncover feedback from a range of participant groups in regards to this issue. To further frame the purpose of this chapter, the research objective discussed in chapter three and relating to this chapter is repeated below:

> "Construct an undergraduate fully-online courseware prototype for a first year university course based on the example topic Intercultural Communication. Design and document the prototype to reflect the current literature and practices on effective user-friendly and learner-friendly design. Design a user-friendly courseware based predominately on constructivist philosophies. Invite students, academics, and professionals to evaluate the courseware, and present a range of perspectives on the user-friendly and learner-friendly design".

In referring to 'what the research says', this thesis refers specifically to the research on user-friendly and learner-friendly design, which is further examined below. The courseware prototype will be designed based on learner-centered principles of user-friendly and learner-friendly design, including a consideration of technological features of courseware, usability and screen design, and the educational features including the application of constructivist principles. Specifically, its purpose is to serve as a working example of a learner-friendly courseware that combines a constructivist-based pedagogy and interactive games along, with web design and usability principles. The courseware is designed to be flexible to learners, to enable them to learn what, when and how they want, whilst facilitating this process. Before describing the theoretical approach to the courseware design, it is relevant to briefly discuss the participants whom the courseware is aimed towards, the researcher's definition of courseware, and lastly her definition of learner-friendly design.

4.1.1 Participant Users

Up to sixteen participants users including students, academics and professionals in Education and Other Disciplines from Tasmania and Victoria in Australia, have been selected to assess the courseware. Thus, potentially providing more insight into the effectiveness of the design methodology through their evaluation. Guest users were also invited - via various educational technology listservs, to assess the courseware, and provide feedback via 'private' email to the researcher or 'public' discussion board/listserv posting on the user-friendly and/or learner-friendly design.

4.1.2 Courseware

Users were informed that the researcher uses the term ‘courseware' or ‘educational media' to refer to a course (academic unit or module) that is delivered predominately online using electronic media and which is Internet-dependent. It is designed to encourage learning, and it generally contains learning content, activities, resources, the ability to interact with instructor(s) and student(s) and often includes links to support services integrated with the courseware provider.

4.1.3 Learner-Friendly

I use the term ‘learner-friendly’ to refer pedagogical environments that are developed to enhance the delivery and use of online learning. These entail a consideration of both the learning design, and the user-friendly design as it is applied to learning. For instance, it involves a consideration of the pedagogical philosophy that frames the design (such as behaviourism or constructivism), a consideration of how this philosophy can be framed towards a design methodology that enables learning, and considering other features which enable learning. For instance, considering the aspects of traditional user-friendly design as they’re applied specifically to learning. For example, thinking about how multimedia objects like graphics and videos may be designed and implemented in a way that enhances learning.

4.2 Design Guidelines

This section details some of the design guidelines that frame the development of the prototype courseware that was evaluated in this study. An in-depth review of the user-friendly and learner-friendly literature on courseware design was provided in the Introduction and Literature Review chapters. This section reaffirms some of the beliefs from this literature, and provides a more practical approach to describing the guidelines, which contributed towards the design of the thesis. Thus, whilst the literature review tended to focus on the conceptual issues on courseware design, this component provides a more specific list of requirements on its design and development.

4.2.1 Learner-Centered Design

There has been a move in the last decade from a teacher-centered to learner-centered pedagogy within Higher Education. This shift sees a move from the role of the educator as a didactic instructor encouraging recall and memorisation, to a facilitator of the learning process (Jacobs and Farrell, 2001). In this vein, the role of the educator must be to facilitate students’ construction of meaning, as opposed to *instructing* students in what to learn. The learner-centered framework philosophically underpins both user-friendly and learner-friendly courseware design, and the overall framework for the design of the courseware. It is relevant to note here, that there are a range of learner-centered design principles, amongst them the APA’s Learner-centered Psychological Principles and the AAHE’s Seven Principles for Good Practice in Undergraduate Education. The main focus of these principles, are to consider the ways in which individual learners learn, taking into consideration that: for learning to occur it

must be meaningful to the learner; that learning is influenced by 'environmental factors' such as culture, technology and instructional practices; that what and how much is learnt is influenced by learners' motivation; that learning is influenced by social interactions; and that learners have different learning strategies and styles.

This thesis appropriates learner-centered principles, and applies them to courseware design. It is worth noting here, the relationship of learner-centered design to user-centered design. Firstly, both focus the methodological approach on the user/learner in order to enhance usability/learning. As McCracken and Wolfe (2004) say "User-centered development is user centric not data centric. It involves users in the process as much as possible with the goal of creating an interface that meets user expectations" (p.5). Likewise, Hatton et al. (1997) notes, "To be truly learner-centered, post-secondary institutions must be responsive to the needs of their students, outside as well as inside the classroom" (www, abstract). Secondly, the role of user-friendly design traditionally refers to the individual using the software as a 'user'. In the context of courseware design however, the user is actually a 'learner', and the guidelines on user-friendly design must apply specifically to learning.

This thesis noted earlier that there is generally a consensus around the principles of user-centered design. It is these principles that this courseware will utilise, and which are briefly discussed below. Some researchers however, believe that usability as it applies to eLearning is rarely considered, and that there is a lack of collaboration between instructional designers and usability experts (Zaharias 2004, Squires 1999). As Squires (1999) states:

> "workers in HCI and educational computing areas rarely speak to each other or take note of each others' work: the educational computing literature is littered with naïve and simplistic interpretations of interface design issues, and many writers in the HCI literature appear to be unaware of the significant developments that have been made in theories of learning" (1999, p.463).

Usability expert Jakob Nielson and Hoa Loranger (2006) believes that specific usability design and evaluation should occur for specific/niche area websites, which would include web based courseware. Where possible, this courseware will attempt to utilise the principles of user-centered design as they apply to courseware design. The following section will detail the general user-friendly guidelines, followed by the guidelines as they apply specifically to courseware design. It is relevant to note however, that it is not the intention of this thesis to create a cohesive set of usability guidelines as they apply to online teaching and learning. Nevertheless, it is anticipated that the evaluation of the courseware and the feedback from the external questionnaire may result in an improved understanding of some of the usability issues as they apply to web-based courseware.

4.2.2 User-friendly Design

4.2.2.1 UF Design for Websites

As a web-based educational software, courseware should be user-friendly. This section provides an overview of the usability design literature and features considered by the researcher in the design of the example courseware prototype. Usability expert Jared Spool (2004) asks “Why go to the effort to make something usable? For some designers, it is because a more usable site means that their site will capture and retain users from sites that are less usable. For others, their reason might be that they like the challenge of eliminating frustration from the user’s experience” (p.xiv). One of the unique features of this courseware design, are its attempts to utilise user-friendly design within an educational setting. The user-friendly design factors considered include technological features, screen design, and interaction design. These issues are details below:

4.2.2.2 Technological Factors

Lauson (2005) lists six factors, which impact upon usability for software systems (websites). These include: functionality – the ability for the system to support real-world tasks; ease of learning – how easy the system is to learn; task efficiency – how efficient it is for the frequent user; ease of remembering – how easy it is to remember for the occasional user; subjective satisfaction – how satisfied is the user with the system; and understandability – how easy is it to understand what the system does? The technological issues that may compromise these factors are those that arise from software and hardware limitations. This is highlighted by Galitz (1997) whom believes that a well-designed screen should be developed within the physical constraints imposed by the hardware – such as a consideration of compatibility issues with other hardware, and effectively utilise the capabilities of the controlling software – such as style guides and graphical display features.

4.2.2.3 Interface Design and Visual Organisation

McCracken and Wolfe (2004) highlight the importance of the visual screen design:

> “Appearance matters with Web pages, just as it does with many other situations. […] On the web, good visual organization (sic) lets users know what content items are related and helps them find pages they want. Content organization and visual organization go hand-in-hand. An effective layout reinforces a site’s content organization, and the result is easy navigation” (p.82).

McCracken and Wolfe (2004) point to four principles of visual organization based on Gestalt psychology: proximity – placing items close together to signify a relationship; alignment – placing related items on an imaginary line; consistency – making related items look the same; and contrast – making different items look different. Likewise, in the chapter “Understand the Principles of Good Screen Design” Galitz (1997) makes the following suggestions for good screen design, which the courseware attempts to follow:

- Each screen element must have meaning to screen users and serve a purpose in performing tasks;
- Provide real-world consistency in regards to users' work and cultural conventions, and internal consistency in regards to following the same conventions across all screens – unless there is a clear benefit in deviating;
- Assist in navigation through alignment and grouping of elements;
- Provide visually pleasing composition through:
  - Balance – providing equal weight of screen elements left right, top and bottom,
  - Symmetry – replicating elements left and right of the screen center line,
  - Regularity- establishing standard spaced horizontal and vertical aligned points,
  - Predictability – be consistent and follow conventional orders or arrangements,
  - Sequentiality – arrange elements to guide the eye through the screen, for instance the eye is attracted to graphics before text, colour before monochrome, dark elements before light, and big objects before little objects,
  - Economy -
  - Unity,
  - Proportion,
  - Simplicity
  - Groupings.

4.2.2.4 Typeface

McCracken and Wolfe (2004) believe words are the most basic element of a webpage, and that to "communicate effectively with an audience, it is important that these words be easy to read" (p.171). They provide the following guidelines for displaying type on the web, which the courseware design attempts to apply:

- Use any typeface that is legible,
- Use 10 point or 12 point type for text,
- Avoid bold or italic text within bodytext,
- Use uppercase only for first letter of sentences and names,
- Use left alignment, and
- Never underline for emphasis.

4.2.2.5 Colour

Colour provides an important aesthetic dimension to web sites, and if used appropriately it can make a page aesthetically pleasing, provide a prompt for navigation, indicate a site's quality and reliability, and enhance usability. If used incorrectly however, it may distract and fatigue the user (McCracken and Wolfe 2004; Nolan 2002; Galitz 1997). McCracken and Wolfe (2004) believe that the question of what combination of colours looks attractive is a "complex amalgam of theory, personal preference, experience and cultural influences"

(p.157). Likewise, Nolan (2002) notes that whilst individual colours are linked to specific cultural meanings, they are also capable of much variation that it makes making absolute statements about their meaning difficult. The courseware design attempted to follow Galitz's (1997) guidelines for the use of colour, as follows:

- Use only enough colours to achieve the design objective,
- Choose harmonious colours, and
- For older viewers or extended viewing choose brighter colours.

4.2.2.6 Interactivity and Navigational Aids

There are three forms of interactivity within courseware: student-computer, student-student and student-teacher. All forms of interaction however, take place through the courseware interface. Kristof and Satran (1995) believe that successful interaction means "a person telling the computer what to do, and not the other way around" (p.34). They believe that this means providing users with clear guidance and options, a clear path through the information, giving the controls that allow users to go where they want and do what they want, and making the experience as easy and intuitive as possible. The theory into practice component of this thesis attempts to follow the author's suggestions for ways in which to do this. These include:

- Ensuring the first screens tell users what they're going to do, see or experience,
- Providing enough balance of images and words for guidance without being overwhelming in detail,
- Utilising effective navigation through minimizing travel between any two points; minimizing depth to avoid unnecessary travel between points; and minimizing redundancy to avoid creating multiple paths to the same place from the same screen.

4.2.2.7 User-Friendly Design for eLearning

So far, the user-friendly guidelines have related specifically to generic web and software design. One of the reasons for this is that this researcher has found only a small body of literature relating specifically to usability guidelines for courseware design. Panagiotis Zaharias (2004) points out that although innovations in eLearning technology proliferate in learning, education and training, there is a need for the evaluation of the technology, and a need to put users and their needs at the center of the development of educational technology. With this in mind, another innovative aspect of the courseware is that its design is also informed by user-friendly approaches as they refer specifically to courseware design. Zaharias (2004) quotes Squires and Preece's (1999) research, which he says adapts Nielsen's (1994) heuristics to take into account socio—constructivist tenets. According to Zaharias, the 'learning with software' heuristics were created in order to address the specific challenges of learner-centered interface design, as well as the integration of usability and learning. They include:

- “Match between designer and learner models
- Navigational fidelity
- Appropriate levels of learner control
- Prevention of peripheral cognitive errors
- Understandable and meaningful symbolic representations
- Support personally significant approaches to learning
- Strategies for cognitive error recognition, diagnosis, and recovery
- Match with the curriculum” (www, para 15).

Additionally Karen Swan (2001) quotes Janicki and Liegle (2001) and provides a list of ten factors to support effective courseware design. These include:

- Instructors acting as facilitators
- Use of a variety of presentation styles
- Multiple exercises
- Hands-on problems
- Learner-control of the pacing
- Frequent testing,
- Clear feedback
- Consistent layout
- Clear navigation
- Available help-screens (p.18).

In her chapter on “Designing Teaching Materials”, Diana Laurillard (2002) points out that student’s reflection must be focused on the learning and not technical issues such as how to operate the program. She adds to the list of factors to support effective courseware design, by communicating her ‘anathemangenic’ – activities which give birth to loathing:

- “looking for how to get started;
- wondering why nothing is happening;
- discovering you are unable to get back to the page you just left;
- being told you are wrong when you know you are right;
- wondering how long this is going on;
- trying to guess the word the program is waiting for;
- wondering what you are supposed to do next;
- coming upon the same feeble joke for the fifteenth time” (p.193).

One of the objectives of this thesis, as articulated earlier, is to establish whether there is a link between user-friendly and learner-friendly design. Since both lists include both user-friendly and learner-friendly design factors, it appears that a link does exist within the literature between these two issues. For instance, in the lists above it appears that poor usability may negatively impact upon learners’ ability to focus on the learning task. Further examination within the analysis chapters may help to discover further linkages.

4.2.3 Learner-Friendly Design

Within this thesis user-friendly design focuses specifically on the technical, and human-computer-interface aspects of courseware design. The Learner-friendly design however is oriented more towards the pedagogical issues relating to courseware design. The relevance of educational theory to courseware design is highlighted by Soloway et al. (1996) whom point out that the design of software for learners must be guided by educational theory. This thesis talked earlier, that there appears to be a lack of consensus in what constitutes learner-friendly. Academics have been arguing for a shift from the teacher-centered transmission model of learning particularly since the mid-1980s, however it is still a dominant model of university teaching (Laurillard 2004; Laurillard 2001; Nunan1988). Thus another innovative aspect of the courseware design is that it attempts to apply learner-centered theory into practice. There are several ways in which it attempts to do this. The research and specifications framing the learner-friendly design of the courseware is discussed below.

4.2.3.1 Theory into Practice: 1

Firstly, and perhaps most importantly, through the application of constructivist based pedagogy – focusing specifically on David Jonassen's model for Constructivist Learning Environments (CLE). As I pointed out in earlier within the thesis, Jonassen's model provides a framework for engaging students in meaningful learning. The CLE framework is illustrated, then briefly detailed below:

According to Jonassen (1999, 2003), learning technologies should be used to keep students' active/manipulative, constructive, collaborative, conversational, reflective, contextualised, complex, and intentional. These are detailed as followed:

- Active/Manipulative:

  -- So that learners actively manipulate tools of the trade, and learn by reflecting on what they have done.
- Constructive:

  -- So that learners make meaning by integrating new ideas with prior ones, and with experience, support and reflection their mental models develop from simple to more complex.
- Collaborative:

  --As learners naturally seek out others to help them solve problems and perform tasks.
- Conversational:

  --Given a problem/task, learners naturally seek out opinions and ideas from others.
- Reflective:

--Learners should be required to articulate what they are doing, the decisions they make, the strategies they use, and the answers they found.

- Contextualised:

  --Rather than abstracting ideas in rules that are memorized and then applied to other canned problems, we need to teach knowledge and skills in real life, useful contexts and providing new and different contexts for learners to practice utilising those ideas.
- Complex:

  --We need to teach knowledge and skills in real life, useful contexts and providing new and different contexts for learners to practice using those ideas.
- Intentional:

  --Learning environments need to support learners in articulating what their goals are in any learning situation (www).

Interestingly, although there is a growing list of literature supporting CLEs, there appears to be a gap when it comes to applying CLE theory to the practice of designing and evaluating a fully-online courseware for undergraduate education. This research attempts to assist in filling this gap. Interestingly, Diana Laurillard (2002) points out that constructivist guidelines reveal how the teacher may encourage constructive learning activities, however they does not prescribe a framework for the design of independent learning environments. When it comes to applying CLE theory to practice, there are multitudes of ways in which it may be applied, and in which the existing literature on CLEs is yet to address. For instance, when encouraging 'collaborative' learning, what are the technology-mediated ways in which to do this, and what are the non-technological ways in which to do this for students studying a fully-online undergraduate course? Does it necessarily mean directing students to collaborate, or should it mean providing simply providing the opportunity for students to collaborate? These are some of the issues faced when applying CLE theory to practice.

4.2.3.2 Theory into Practice: 2

Secondly, the research also attempts to apply theory to practice through the application of other learner-centered guiding principles. David Nunan (1988) lists some possible features of the learner-centered curriculum which this research takes into consideration, including:

- Providing learners with efficient learning strategies,
- Assisting learners identify their preferred way of learning,
- Assist learners to develop skills to negotiate curriculum,
- Encourage learners to set their own objectives,
- Encourage learners to adopt realistic goals and time frames, and
- Develop learners' skills in self-evaluation.

Hannafin and Peck (1988) and more recently Karen Swan (2003) listed the characteristics of effective educational technology, which also informed the design of the courseware. According to Hannafin and Peck (1988), Effective computer assisted instruction should include the following aspects:

- "Specifies instructional objectives
- Matches learner characteristics
- Maximises interaction
- Adapts to the needs of individual students
- Maintains student interest
- Approaches the learner positively
- Provides a variety of feedback
- Fits the instructional environment
- Evaluates performance appropriately
- Uses the computer's resources wisely
- Is based on principles of instructional design
- Has been evaluated thoroughly" (p.23).

According to Swan (2003), effective online learning has:

- "Clear goals and expectations for learners,
- Multiple representations of course content,
- Frequent opportunities for active learning,
- Frequent and constructive feedback,
- Flexibility and choice in satisfying course objectives, and
- Instructor guidance and support" (p.19).

In summarising the above guidelines, this courseware attempts apply theory into practice by implementing to some extent the features listed below (it is important to note here, that researcher considers the features regarding multiple representation of knowledge and co-construction of the learning objectives to be located specifically within the realm of the constructivist-based features of the courseware design – which are briefly detailed in the section above):

- Adaptive Design:
  --Adapting to the requirements of learners, as opposed to a completely linear and non-flexible interface.
- Interactive Design:
  --Enabling learners to interact with the content, their peers and instructor, through activities, synchronous and asynchronous communication technologies.
- Personalised and Individualised Design:
  --Greeting learners individually, creating a sense of 'virtual community', and considering that learners each have unique learning styles and preferences.

- Flexible Design:
  --*Enabling learning on a flexible basis, so that learners can login to the courseware 'anytime' and 'anyplace'.*

4.2.3.3 Theory into Practice: 3

According to the research learner-centered courseware should put the learner at the center of the teaching methodology. Interestingly, this researcher questions whether this may mean that there may still be a role for objectivist theory within the practice of courseware design. Like John Bain (2003), this researcher does not refer to reverting to 'drill them into boredom' methodology. Rather, it refers to Bain's point in "As the pendulum swings from objectivist to constructivist pedagogy that we may be at risk of losing sight of some important lessons of classical education practice" (p.1382). The problem however, is what are these 'important lessons' of classical education that should be kept? One of the potential problems Bains (2003) recognises that the current focus on ill-defined real-world tasks, "may underestimate the importance of instruction to constructed learning" (p.1385). This leads to the complex question: Can constructivist-learning environments include a level of direct instruction? Another way of thinking about this, is:

> *Do learners respond positively to high levels of instruction? And, if so, is it possible to provide learners with a high level of instruction, whilst encouraging them to become independent learners?*

This researcher assumes that as long as the instruction does not discourage multiple representations of knowledge and enforce a particular representation of knowledge then the answer may be 'yes', although other researchers would disagree. Furthermore, it is also assumed that scaffolding learning through direct instruction doesn't necessarily compromise the constructivist learning. In fact, it may actually be necessary to provide a level of direct instruction, in order for students to become independent learners. Keeping this in mind, the design of the courseware includes a level of direct instruction in order to scaffold learners from lower to higher levels of knowledge, towards a more independent learning method and provide a structured learning option for learners. It is anticipated that the evaluation of the courseware may elicit feedback from participants, which helps sheds light on the level of instruction preferred.

Finally, Bain (2003) also recognises that there one of the dominant problems with implementing constructivist learning is for teachers to reconcile their intuitions about the importance of teaching, with making sure that students do the learning (2003). Educational games are becoming more prevalent within undergraduate courseware, as educators start to realise their potential. Marc Prensky (2002) for instance, believes that well-designed games will encourage learners to become more engaged with the content, and thus more motivated to learn. He also points out that it is the job of educators to instruct and not to motivate. It is

however the assumption of this research that encouraging learner motivation should be an explicit objective of courseware design. Hence, this courseware also includes games-based activities for lower level recall (objectivist based), and higher level problem-solving (constructivist based). It is intended that the evaluation of the courseware may also elicit feedback from participants, which sheds light on the role of games to encourage low-level and high-level learning and motivation. It may also provide some insight into whether participants believe there is a role for objectivist based 'drill' activities, for stimulating recall within contemporary courseware.

4.3 Courseware Design

The relevant literature on the design of courseware has just been covered. This section details how aspects of this literature were utilised in an attempt to create a learner-centered user-friendly and learner-friendly courseware. Specifically speaking, the innovative nature of this courseware theory into practice includes the following features:

4.3.1 User-Friendly

4.3.1.1 Integrating Technological Constraints

This includes a consideration of the technical features of courseware design, which impact upon effective usability. It is assumed that the courseware prototype is compatible across different hardware and software platforms. Learners' may request a copy of a CD-Rom, which is an offline fully-functional version of the courseware, to avoid frustration from potential hardware and software issues caused by lengthy downloads for instance. Learners must however, login regularly to the online courseware in order to view course news and updates, and collaborate with the lecturer and/or peers. A first-time (ft) tutorial instructs learners on the hardware and software requirements – including essential, highly recommended and optional. Learners' may download most of the software via the courseware's download link. The ft tutorial also instructs learner' on basic computer security issues – including installing anti-virus software and spyware, and regularly backing work up.

4.3.1.2 Minimum Computer Skills and Accessibility

Since the courseware is fully-online, the design must be considerate of minimum levels of computing skills required. The courseware is designed to be considerate to learners' different levels of computer skills, at the time of commencing their learning. For instance, learners with advanced levels of computer literacy may choose to skip aspects of the ft tutorial, whilst those with lower levels of computer literacy may choose to go through the tutorial in-depth *and* access the Help section for computing help throughout the course duration. The ft tutorial instructs learners on the minimum computer skills required before starting the course. There is also an optional face-to-face tutorial before the course starts, in which learners may

be guided through the courseware. The online tutorial activities are designed in order to scaffold learners towards more advanced computing skills necessary in order to obtain a wider range of research collection and interactivity. In regards to accessibility, the courseware is not specifically designed to be accessible for learners with special disabilities, as it is assumed that courseware that is accessible for learners with special disabilities may not be accessible for a general audience.

4.3.1.3 Ergonomics

Ergonomics appears to be rarely considered when it comes to courseware design. The ft tutorial includes a component on the ergonomical considerations of studying online, which may impact upon the ability to use the courseware effectively. It includes advice on how to avoid mental and physical fatigue, stress, and injury, and a link to the NOHS occupational health and safety website.

4.3.1.4 Harmonious Screen Design

The courseware follows the user-interface guidelines of McCracken and Wolfe (2004) and Galitz (1997), in order to encourage effective content organisation, and visual organisation. The courseware explicitly uses a combination of navigational elements, text written ‘for the web’, relatively ‘bright’ web-friendly colour combinations in an attempt to enhance visual pleasure, and multimedia elements for instruction and ‘just-in-time ‘ (JIT) content elements. The multimedia elements include a video that may be watched on-screen, or downloaded in different formats such as text, audio or video for enhanced accessibility and usability. Each format includes the same information, formatted slightly differently according to the requirements of the presentation mode. In respect of the potential technological issues that may impact upon usability, multiple formats of material are provided, and users’ may choose to download all multimedia at once via the Downloads section of the courseware. They may also choose to request the cd-rom version of the courseware, to avoid lengthy downloads altogether.

4.3.1.5 Help Features and Navigational Aids

Various help features and navigational aids are included, in order to encourage effective usability and scaffold learners towards higher levels of computer literacy. These include the ft tutorial, which learners’ are sequences through the first time they use the courseware and may access it any time after that through the Help logo on the homepage. The logo is accessible within the navigational bar top right of the screen. This bar includes a range of help and navigational features, including a link to Home, Help, Site Map, Glossary and Contact details. The Help section also includes a link to content and technical help. The homepage is designed in order to work as a visual site-map, through the use of visual organisation and drop-down menus. Further navigational aids are provided through a Start

Tips logo and the multimedia downloads on the homepage, which includes an introduction by the course instructor with navigational tips.

4.3.2 Learner-Friendly

4.3.2.1 Blended Learning Option

To encourage a more learner-friendly approach to the delivery of the courseware, learners may choose to attend the optional face-to-face meetings. These meetings are optional, and intended to provide learners' – whom may prefer a level of face-to-face interaction, to develop a collaborative and conversational relationship with their peers, and an enhanced student-teacher relationship with their supervisor. It is relevant to note however, that students who attend the face-to-face meetings may not necessarily have an advantage over students whom does not attend. No new content will be covered at these meetings, and all discussions will be posted on the course discussion board. In regards to the course material covered, the first material provides learners with an overview of the course, whilst the subsequent meetings are intended to discuss the assignments, and obtain any summative evaluation of the course content or course material.

4.3.2.2 Individualised

Research has found that learners respond positively to courseware that is individualised. The courseware caters to this feature in the following ways:

- **Adaptability**: By greeting students by their first name on the homepage, enabling them to see how many discussion board, personal messages or emails they receive and linking to these on the homepage, and by enabling students to personalise their Profile – which is the first point of contact for other students to learn about their peer.
- **Learning Styles**: The courseware explicitly uses a range of multimedia, including text, audio and video, for each of the primary sources of course content. The purpose of this is to appeal to a range of learning styles and preferences, enhance usability, and attempt to encourage learner motivation through enabling learning via their preferred learning mode. Learners are encouraged to download the material and discover how they learn best. That is, they may choose to download the text of the courseware and work away from their computer, they may download the audio and listen to it on their iPods while exercising, or them may download the video and watch in on their laptops or DVD players.
- **Learning Strategies** Learners are encouraged to identify their preferred ways of learning and scaffolded towards their preferred ways of 'learning how to learn' online. For instance, they are provided with various coaching tips, such as a contextualised case study in which the instructor details how she learns even when she is at the gym

– by reflecting on the course content, and sending herself key messages about her thoughts on her mobile phone.

4.3.2.3 Flexibility

The courseware encourages learner-flexibility, in a number of ways. Firstly, learners may access the courseware ‘anytime, anywhere’. Secondly, the courseware features open-ended navigation, so learners can choose ‘where they want to go’, rather than follow a specific navigational path. It is however, expected that the task-based tutorial and assignment activities will drive their navigation. Thirdly, to encourage learners to co-construct their objectives and directly navigate their meaning-making experiences, they have a level of flexibility in regards to the topics of their three major assignments.

4.3.2.4 Educational Games

Educational games are becoming an important aspect of contemporary courseware design. The courseware includes two types of games for each of the five content sections. The first type of games based activities will be used to cover lower-level thinking, through drill-style exercises, intended to motivate learners to cover and learn key domain content for each area of the course content, within a fun educational environment. Other activities will be included to supplement the course content through additional case study examples, to encourage problem-solving, and present a broader range of solutions to case problems.

4.3.2.5 Constructivist Features

4.3.2.5a Open-Ended

The courseware navigation is designed to be generally open-ended. So, from the homepage learners may choose which order they view the main areas of the courseware. For instance, the Course Information, Course Content, Activities, Communication elements, or Resources.

4.3.2.5*b Problem Based*

The courseware is problem based, so the goals of the courseware drive the learning, from the open-ended structure and navigation of the learning, its content – including the supporting cases and just-in-time resources, and problem-based activities component. The courseware is centered around five objectives, which are intended to scaffold learners in utilising the online medium effectively, before engaging students by encouraging their personal meaning-making of aspects of intercultural communication, and then through collaborative and conversational online learning. The initial three tutorials are intended to assist learners with utilising the online medium effectively, by negotiating the courseware and enabling a wide-range of research collection abilities. The following two tutorials and assignment activities are ill-structured tasks intended to drive the learner through the course navigation and content. The problems encourage learners to personally and/or collaboratively construct their understanding of their chosen key topics within intercultural

communication. In doing this, they will need to engage in a learning environment that is intended to keep them 'constructive, collaborative, intentional, complex, contextual, conversational and reflective'.

For example, the first assignment asks learners to create a webpage, in which they will need to paste a link to the fifth assignment topic (where they have presented multiple definitions of intercultural communication), and create and present three case studies related to intercultural communication. This ill-structured problem, will mean that learners will have to be actively manipulate aspects of the courseware to construct their answer, they will need to build upon existing mental models through support tools, they will need to collaborate with the lecturer and/or peers to develop from simplified to more complex understandings, their learning will be goal-directed (intentional), they are encouraged to present the complexity of their problem as opposed to recalling a predefined answer, their case studies will be contextualised within authentic real-life contexts, the will need to use the technology to seek out multiple opinions of their problem – as that is what they are presenting, and they will need to be reflective when articulating the context of their case studies.

4.3.2.5c Active Learning Opportunities

The Activities component of the courseware includes educational games, as mentioned above. Some of these games are directed at lower-order-thinking, however there are also games based activities that encourage active learning of each area of the course content. Learners can manipulate objects – such as 'drag and drop' features, in order to obtain feedback about their actions.

4.3.2.5d Related Cases and Worked Examples

Learners are provided with related cases throughout the courseware, in order to scaffold student memory and enhance cognitive flexibility. For instance, the first assignment task includes an 'example case', to encourage learners to construct their understanding of one way in which they may complete the task. Furthermore, each of the five content sections include cases relating to key areas of the content section, as well as suggested cases which learners could complete for their assignment task (these cases are built specifically on the principles of Jonassen's constructivist learning environments). For instance, the section on 'Culture and Cultural Values', includes a CLE on Cultural Shock. This CLE presents the 'case' that is contextualised within a real-world context, along with four questions/problems. Learners are provided with authentic real-world 'advice' from a range of sources, each addressing a different area question. There is also a supplementary range of JIT texts, to support the learning. The CLE in effect, works as a 'worked example', for the students' first assignment topic.

4.3.2.5e Just-in-time Learner-selectable Information

The courseware includes a range of JIT resources, aimed to support student learning. The first level of resources, include the multimedia download section, discussed earlier in the chapter. This includes a presentation by the course instructor, which covers key areas of the content section. The second level of JIT resources is located within each content section. They include a range of related online and paper-based resources, each providing different perspectives of the content topic. The third level of resources are available from the Resources section of the website. Learners may download a range of online or print based resources, they may sign up to an rss newsreader where key resources are sent to their RSS Inbox as they're published on the resource's website, and a link to library resources.

4.3.2.5f Cognitive (knowledge construction) Support Tools

Jonassen (1999b) says CLEs present complex, novel and authentic tasks that students should be supported in. Jonassen also suggests that for those required skills that are not likely to be possessed by learners, it is necessary to use cognitive tools that scaffold learners' abilities to perform those tasks. The courseware provides the following cognitive support tools:

- Online Journal: to encourage learners to present what they know or what they are learning. That is, for them to construct their own meaning through personal reflection of the content.
- Educational Games: The games are intended to provide a degree of both lower-level and higher-level cognitive support, by modelling a range of topic-specific answers. The interactive activities are also intended to provide an effective form of feedback, which combined with help resources and the collaborative tools, should encourage intrinsic and extrinsic motivation.
- Content Links Panel/RSS Reader/Discussion Board/Online Chat: To enable learners to gather information needed to solve the problem.

4.3.2.5g Conversational and Collaborative Support Tools

In order to support conversation and collaboration between online learners, their peers and instructor, a range of activities and tools have been provided. It is necessary to note here however, that the courseware supports a high level of flexibility when it comes to *how and when* students interact with their peers and instructor. Whilst there is much literature regarding the importance of social-collaboration to higher order learning, it is an assumption of this courseware that learners must have a degree of choice when it comes to *when* they need to seek help and collaborate. The conversational/collaborative support tools include

- Discussion Board: To enable learners to collaborate asynchronously with their peers and instructor. All topic areas are public, so that all learners can read other learners

and their instructor's posts. It includes a space for Netiquette, Chit-Chat area, FAQ Area, and areas relating to specific content topics and activities.

- PM: Learners may choose to send each other short personal messages, which can be viewed asynchronously and which are private.
- Email: Learners may also communicate longer messages asynchronously via email, to one or more learners, their instructor, etc.
- Chat: Learners may chat to each other or their instructor synchronously, and their conversations may be private (between a select group) or public (viewable by all learners). If they have webcam, then the courseware also enables voice and video chat.
- Who's Online: In an attempt to encourage a community of learners and encourage an inclusive personal learning environment, the courseware encourages learners to personalise their profiles and provide a range of support tools for online collaboration. Learners can view who's online at the same time as they are, they can view other learners' profiles, and they can use the 'Who's online' interface to communicate via PM or chat.
- Instructor Profile: The instructor's profile is also personalised and a multimedia videos of the instructor included, in an attempt to encourage a more welcoming and friendly approach to the design, and establish the instructor as facilitator as opposed to dictator of the learning.

4.3.2.5h Coaching

In order to support constructivist learning, the instructor acts as coach and facilitator. A range of methods has been implemented to scaffold and facilitate student learning. For instance:

Motivational Prompts: In order to facilitate the process of engagement, learners' are informed that participating in the tasks of the courseware - from interaction within the discussion board and chat, to the tutorials and assessments will all be included as part of their overall mark. They are also encouraged to reflect in various ways, on how the learning is personally meaningful to them.

- The Start Tips: These direct learners towards the navigation of the courseware, course expectations and objectives.
- Course Introduction: The multimedia course introduction on the homepage includes tip and hints to help learners' navigation the courseware and its assessment.
- Prompt Collaboration: Learners are encouraged to collaborate, for instance the tutorial assignments suggests that learners post a message about themselves and communicates with at least one other student.
- Provide Feedback: The learners' are able to obtain both intrinsic and extrinsic forms of feedback from the courseware, peers and instructor, through a range of tools. For instance, through the activities, help tools, discussion board, email and chat

functionalities. A strong student-teacher relationship is encouraged, through the strong presence of the instructor within the content presentation – such as photos, case examples and multimedia, and the always-available contact link to the instructor.

- Analogies: In order to scaffold learners' towards more independent and facilitate their understanding of the learning tasks, a range of analogies is used.

4.4 Courseware Prototype

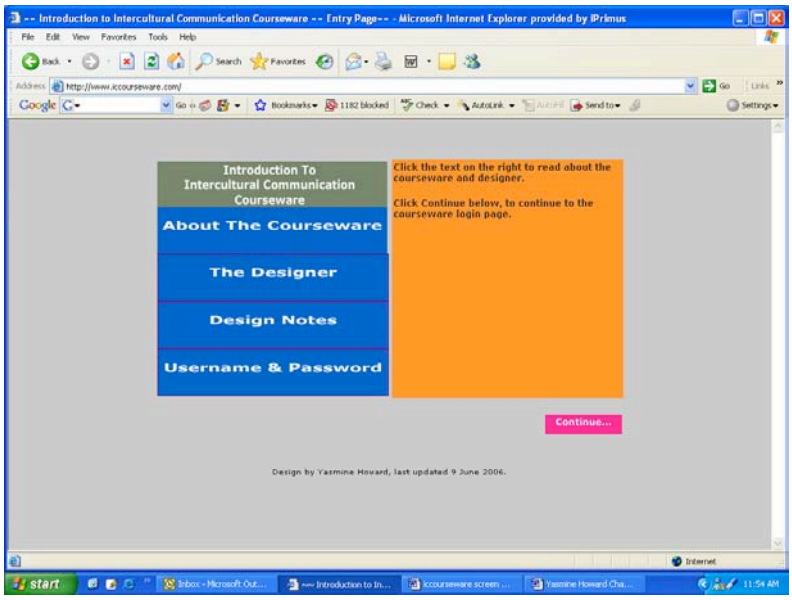
So far this chapter has covered the relevant literature on the design of the courseware, and it has provided some in-depth examples of how this literature was utilised in practice, to design a learner-centered courseware based on the contemporary literature on user-friendly and learner-friendly design. The remainder of this chapter will present screen captures of the courseware interface, along with relevant details related to each screen.

4.4.1 Introductory Pages

As discussed in the previous chapter, a range of participants, both face-to-face and online, is evaluating the courseware. The introductory pages have been included to provide these viewers of the courseware with relevant information contextualising the courseware and its design. Also, text instructions for both interview participants (face-to-face) and guests (online) are included separately in relevant areas of the introductory pages. The introductory screens include the courseware logo, one main menu bar and a text space. The menu bar includes four buttons. Four of the buttons are hyperlinks to information 'About the Courseware', 'The Designer', 'Designer Notes' and 'Username and Password'. The fifth buttons enables learners to Continue to the courseware, from any of the introductory pages.

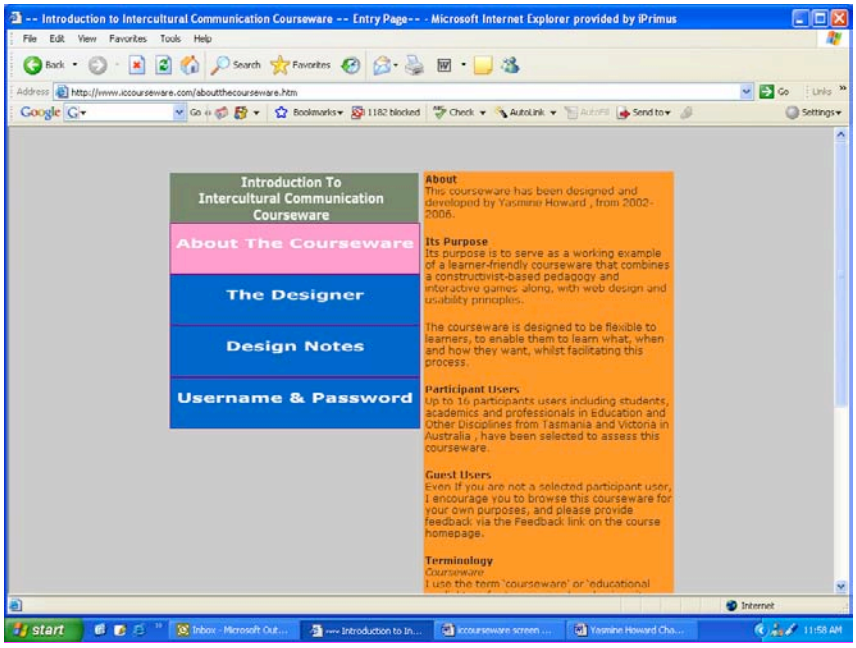
The first screen is shown in Figure 4.4.1a below. It includes instructional text, guiding learners to click the buttons or continue to the courseware login page.

Figure 4.4.1a Splash Page (First Screen)



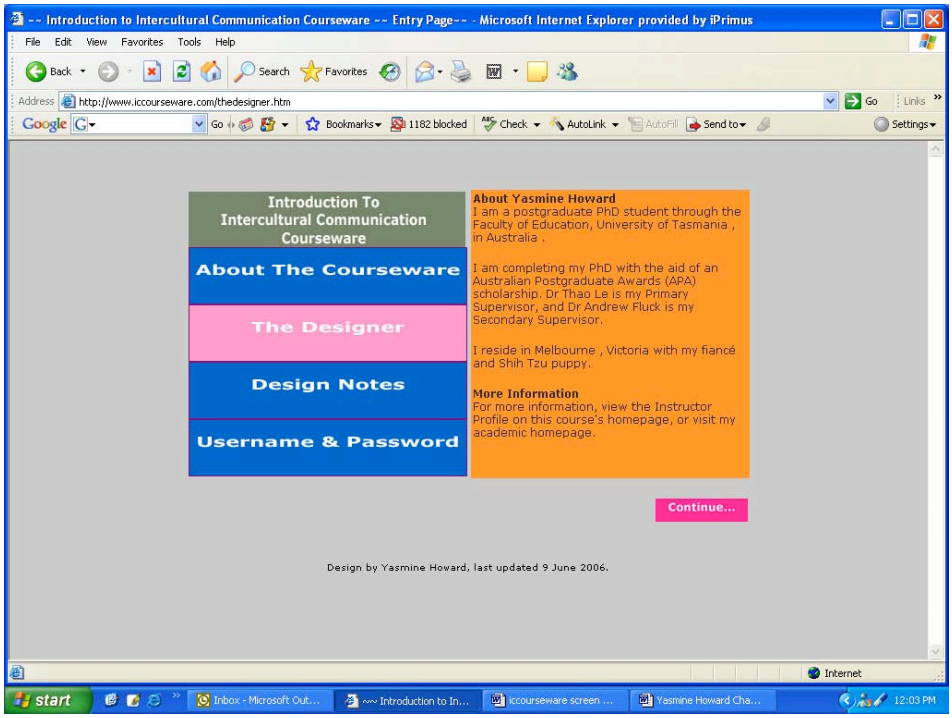
The screen shot shown in Figure 4.4.1b below, shows the interface when the About button is selected. Learners are instructed on the purpose of the courseware here. The text reads “Its purpose is to serve as a working example of a learner-friendly courseware that combines a constructivist-based pedagogy and interactive games along, with web design and usability principles. The courseware is designed to be flexible to learners, to enable them to learn what, when and how they want, whilst facilitating this process.” There is also instructional text for interview participants and guests, and some notes on terminology.

Figure 4.4.1b Splash Page (About)



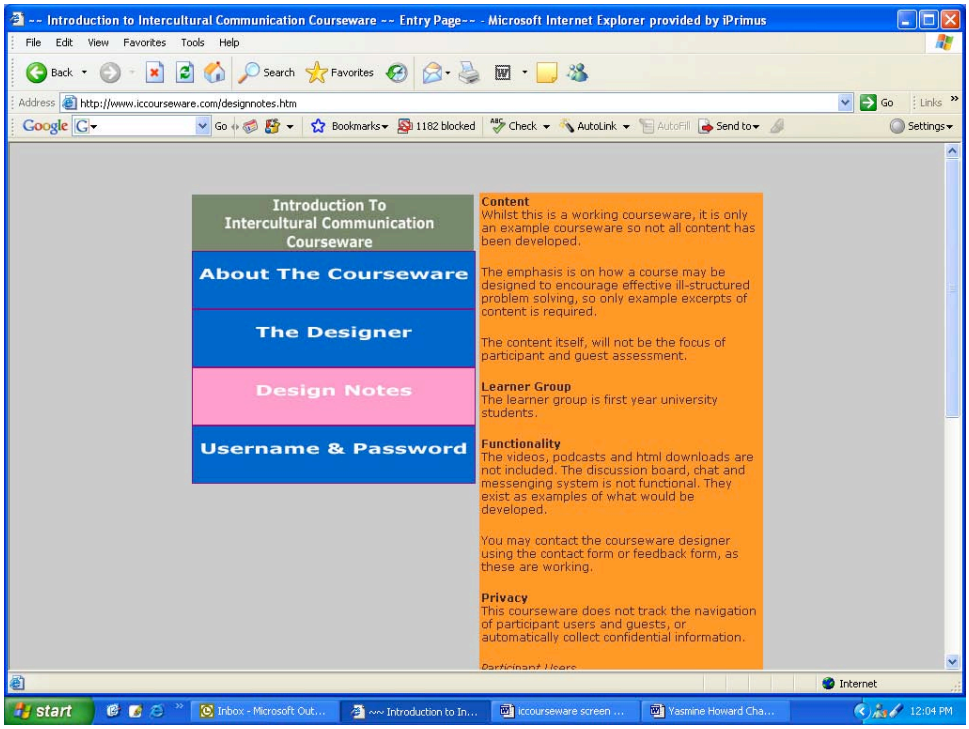
The screen shot shown in Figure 4.4.1c below, shows the interface when The Designer button is selected. This page includes information about the courseware designer.

4.4.1c: Splash Page (The Designer)



The screen shot shown in Figure 4.4.4 below, shows the interface when the Design Notes button is selected. It is here that learners' are informed that the courseware is a prototype only, and that the content itself is not the purpose of evaluation. Privacy issues are covered here, for both interview participants and guests. Interview participants are informed here that they will not be identifiable in any way. Guests are informed that if they choose to submit feedback, they can do this via direct email to the researcher or via the online message board. If they select the latter, then they may choose not to identify themselves.

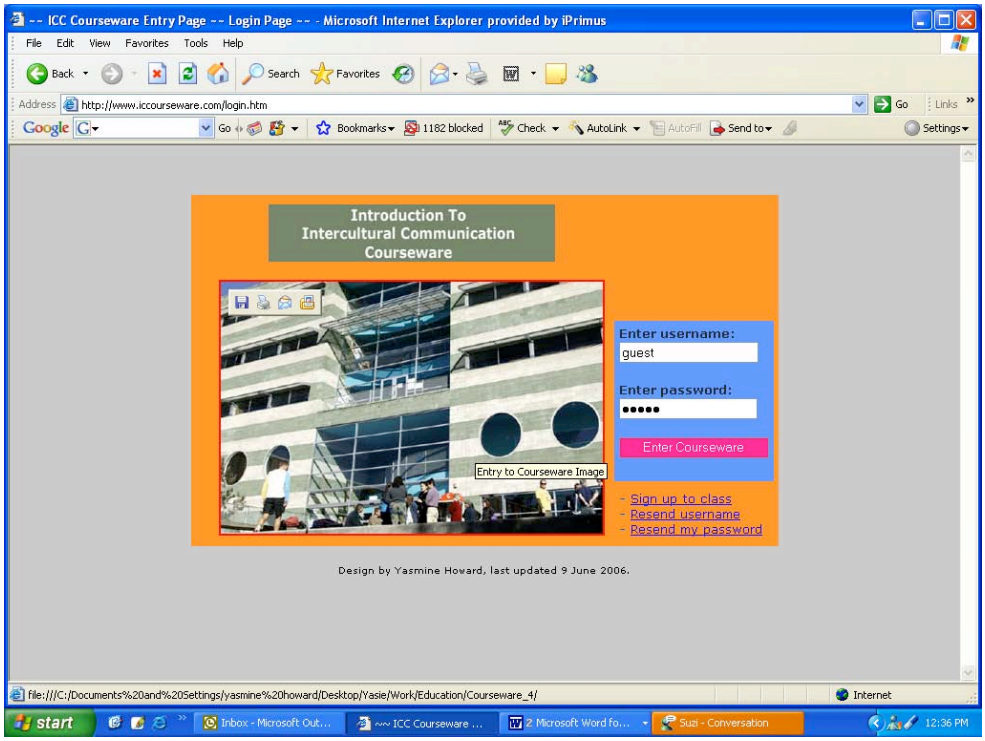
4.4.1d: Splash Page (Design Notes)



4.4.2 Login Page

The courseware login page is depicted shown in Figure 4.4.5 below. It includes a link for learners' to sign up to the class. There is also a usability option that enables the courseware to resend forgotten username and passwords.

Figure 4.4.2 Login Page



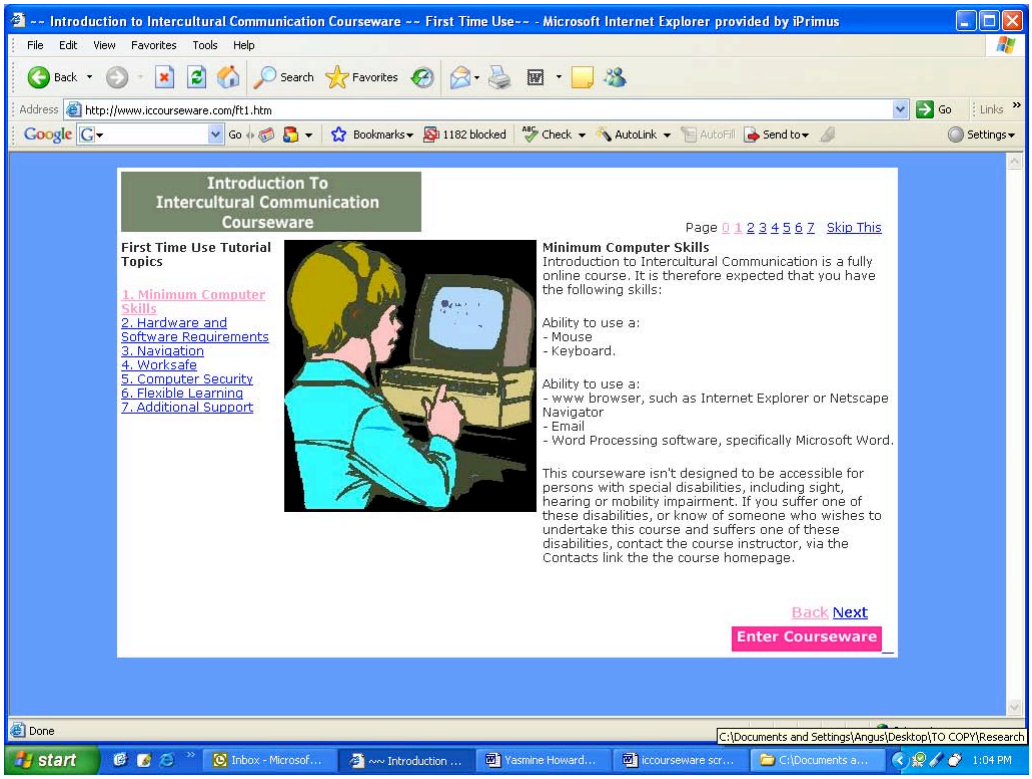
4.4.3 First Time Tutorial Pages

The first time learners' enter the courseware, they are taken to the First Time Tutorial. The central screen space includes a static graphic element on the left, and text on the right. A download bar below the text enables learners' to download the tutorial as printable document, in three different forms for accessibility. There is one main menu. The first and main menu includes the following hyperlinks: '1. Minimum Computer Skills', '2. Hardware and Software Requirements', '3. Navigation', '4. Worksafe', '5. Computer Security'. '6. Flexible Learning', and '7. Additional Support'. There are two navigational aids here. The first is located top right, and enables learners' to skip to the page number, or skip the tutorial entirely. The second is located bottom right, and enables learners' to navigate Back and Next. The Enter button enables learners' to enter the courseware, from any page in the tutorial. The first screen in the First Time Tutorial is displayed in Figure 4.4.3a below. It includes a static graphic of the courseware instructor, and text that introduces learners' to the instructor and provides navigational help.

Figure 4.4.3a First Time Tutorial (Page 0)

The 'Minimum Computer Skills' screen is displayed in Figure 4.4.3b below. Its text lists the expected computer skills of learners' using the courseware, and informs learners' that the courseware is not designed to be accessible for students with special disabilities.

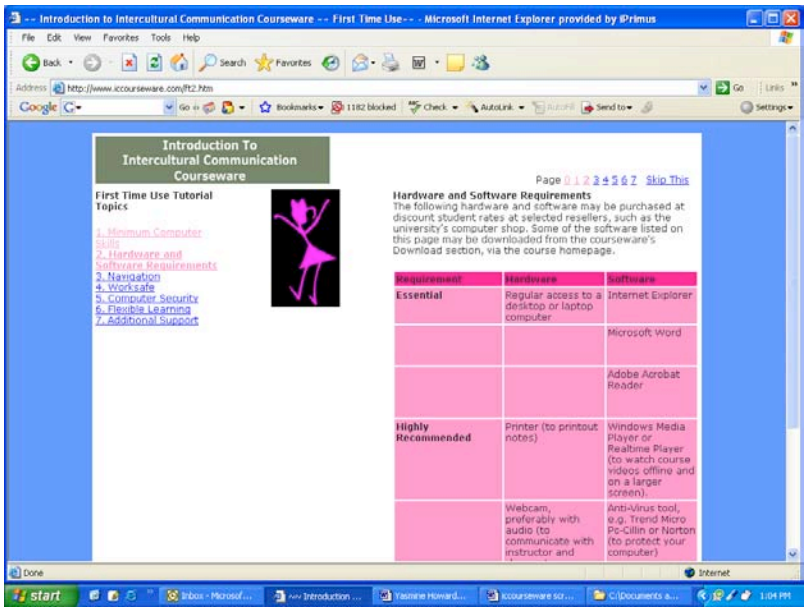
Figure 4.4.3b: First Time Tutorial: Minimum Computer Skills



The 'Hardware and Software Requirements' screen is displayed in Figure 4.4.3c below. It provides instructional text informing students where they may purchase the hardware and software necessary for the course. Some of the software may be downloadable via the course homepage. Below this text is a table, listing essential, recommended and optional

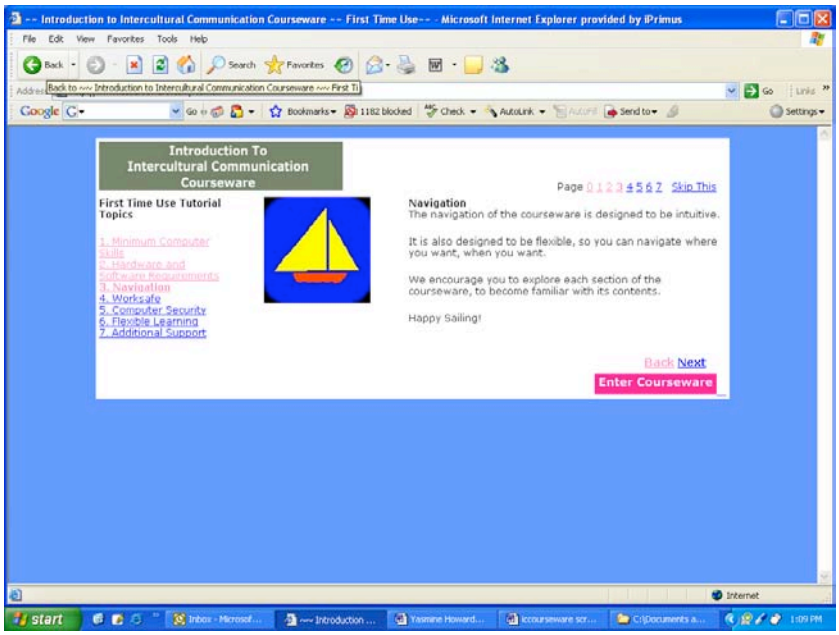
hardware and software, with relevant notes explaining the rationale for each. It is essential that learners' have access to a desktop or laptop computer, Internet explorer, Microsoft Word, and Adobe Acrobat Reader. It is highly recommended that they have access to a printer so they may print out notes, webcam with audio, windows media player or real time player to download and watch course videos offline, and anti-virus and spyware tools to protect against harmful viruses and spyware associated with being online. Lastly, it is optional for students to have a cd/dvd burner, so as to save a backup of their course files.

Figure 4.4.3c: First Time Tutorial: Hardware and Software Requirements



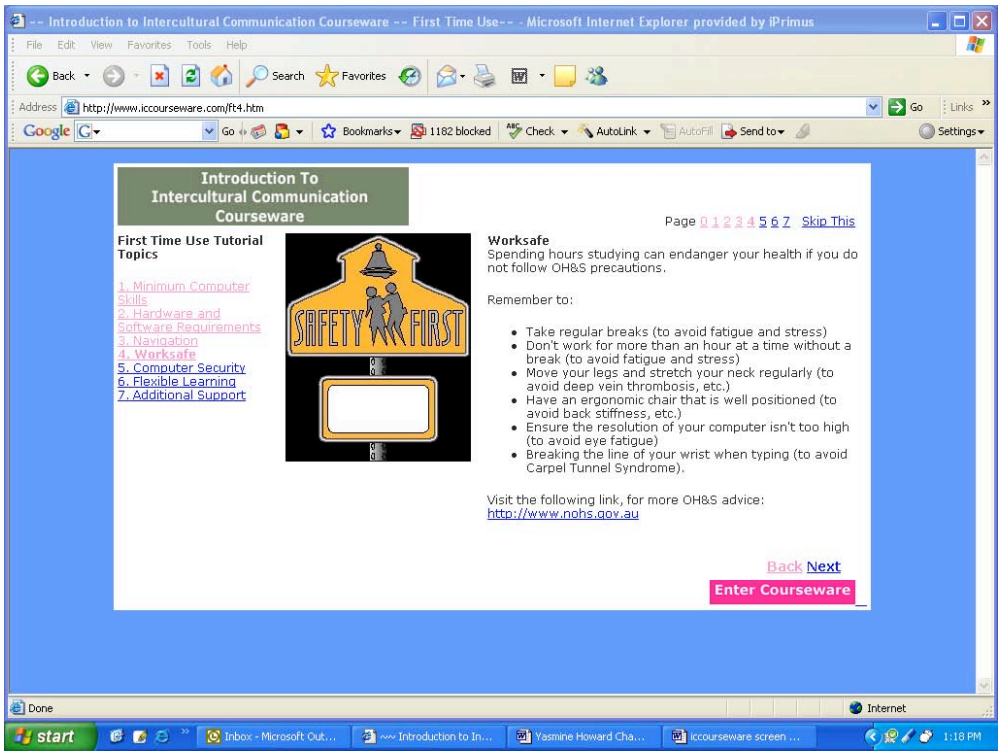
The 'Navigation' screen is shown in Figure 4.4.3c below. The text informs learners' that the navigation is fully flexible, so they can go 'where they want, when they want'. It encourages learners' to fully explore the courseware.

Figure 4.4.3d: First Time Tutorial: Navigation



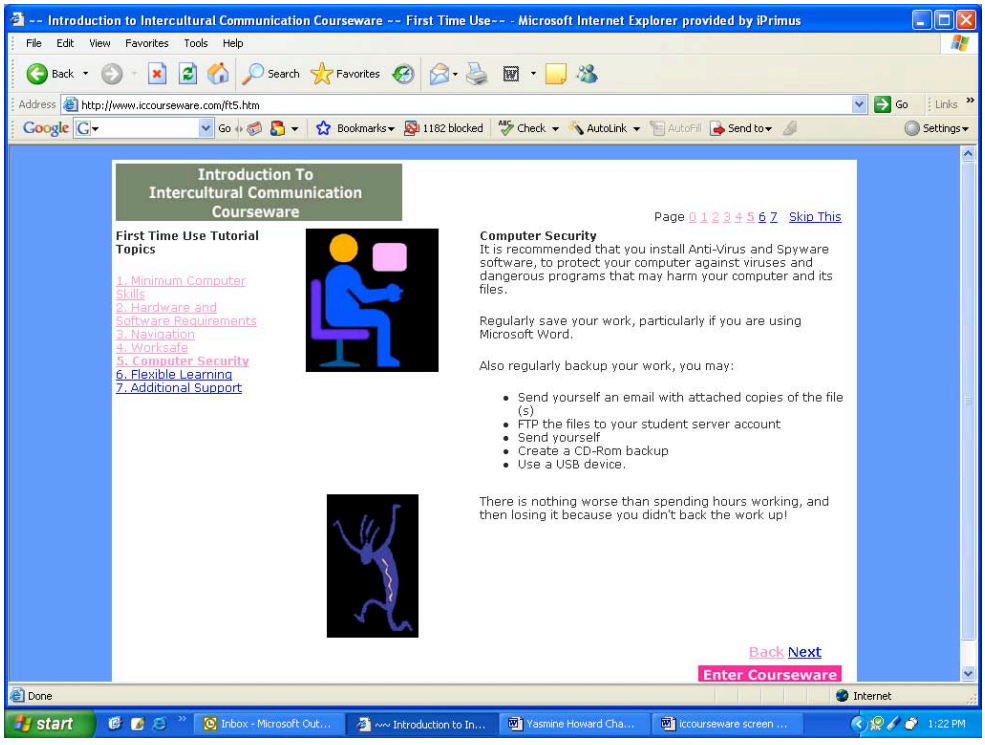
The ‘Worksafe’ screen is displayed in Figure 4.4.3e below. It includes a list of recommended safe work practices for studying online, and a link to the Australian National Occupational, Health and Safety website for further information.

Figure 4.4.3e: First Time Tutorial: Worksafe



The ‘Computer Security’ screen is displayed in Figure 4.4.3f below. The instructional text recommends that learners’ download anti-virus and spyware tools, and backup their work regularly. It lists ways in which learners’ may do this.

Figure 4.4.3f: First Time Tutorial: Computer Security



The ‘Flexible Learning’ screen is displayed in Figure 4.4.3g below. This screen is slightly different to the others in the First Time Tutorial, as it includes an additional sub-menu under the title ‘Flexible Learning Topics’. The topics are listed ‘6a. Video, Audio or Text’, ‘6b. Downloads and Printouts’, ‘6c. Motivation and Fun!’, and ‘6d. Work Independently and/or Collaborate’. Topic 6a included information about the use of video, audio and text in the courseware. Learners’ are instructed that some material may be downloaded in any of these formats. Topic 6b recommends that learners’ download and printout course notes, and suggests ways in which learners may work away from the computer. Topic 6c includes an analogy of how the course instructor works, and encourages learners’ to find their own way of working that enhances their motivation. They are informed:

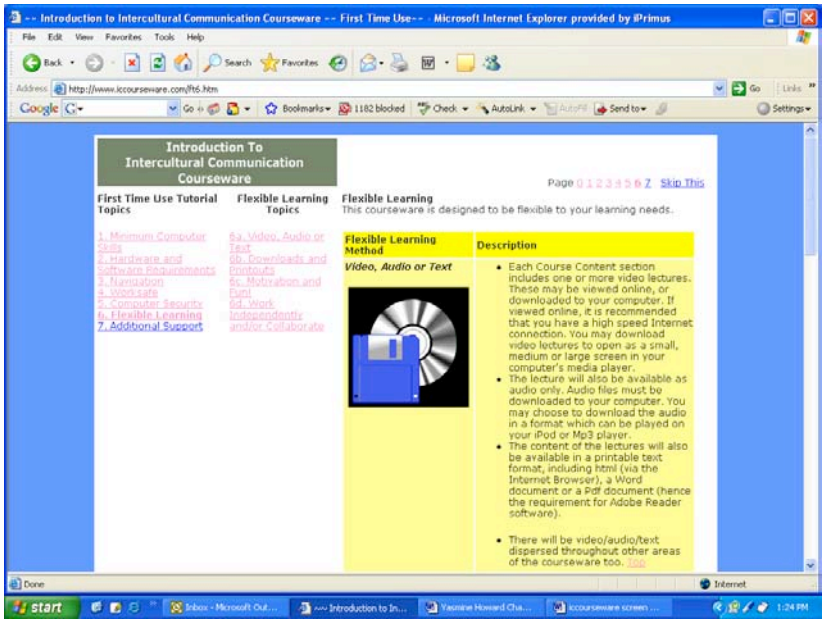
> “The point I'm trying to make, is that learning can fit into your lifestyle, and should be more motivating for you if you learn in a way that's best for you. To use a metaphor, think and learn ‘outside the square'. You are not learning in a regular classroom, so make the most of the strengths of learning online.”

They are also informed that:

> “There are no regular days and times for face-to-face lectures and tutorials, so you will need to be disciplined about setting aside time for study. Regularly logging into the courseware, and getting to know your instructor and classmate will help you create a supportive network of learners and friends.”

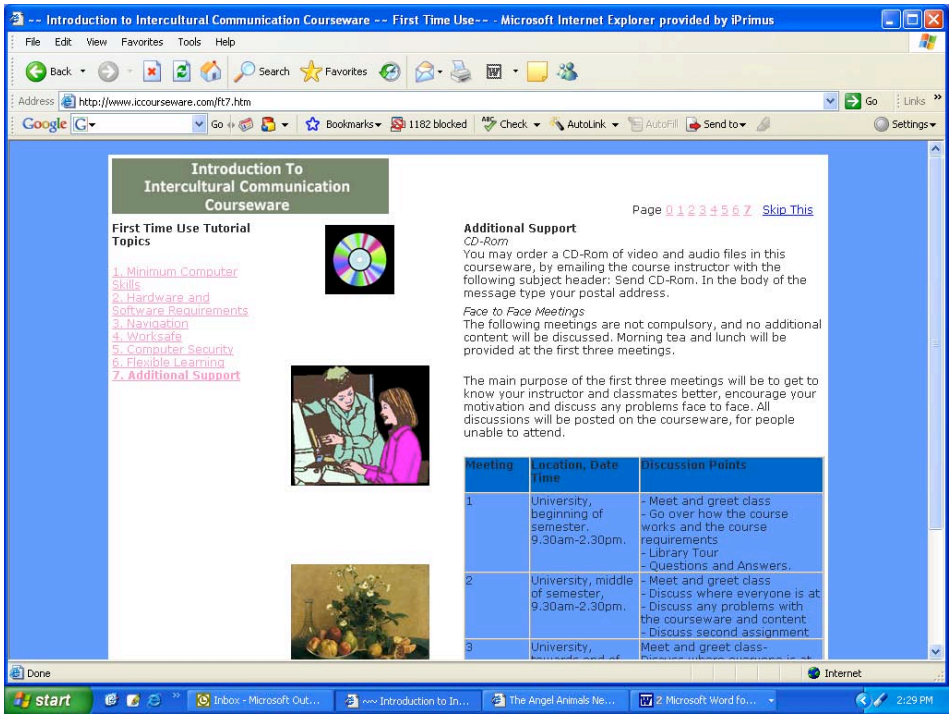
In topic 6d learners’ are informed that the courseware includes online tutorials and assignments, in which it will be necessarily to collaborate as part of a group for at least one assignment. They also however, may choose to work independently for much of the courseware, although there are four online communication tools provided in the courseware, and significant opportunities for collaborating with their lecturer and peers.

Figure 4.4.3g: First Time Tutorial: Flexible Learning



The final screen in the First Time Tutorial 'Additional Support', is displayed in Figure 4.4.3h below. The text informs learners that they may order a cd-rom of the courseware, which includes the entire course offline. They must however, login to the courseware regularly for site, news and other message updates. The table includes a list of optional face-to-face meetings, throughout the duration of the course. Learners' are informed that the face-to-face meetings are to meet the lecturer and their peers, and to discuss course content in person. All discussions will be available online for learners' who do not attend.

Figure 4.4.3h: First Time Tutorial: Additional Support



4.4.4 Homepage

The homepage screen is displayed in Figure 4.4.4a below. The course logo is located top left. There are four different menu bars, each grouping related items:

- The first menu bar is located top right, and each of the menu items comprise of text and graphical icons. It includes links to navigational and learning aids. These links include 'Home', 'Help', 'Site Map', 'Glossary', and 'Contact'.
- The second menu bar is the main menu bar for the courseware, and is centered at the top of the screen This menu includes five buttons, each with a drop down menu – as show in Figure 4.4.4b. The buttons are links to 'Course Information', 'Course Content', 'Activities', 'Communicate' - which is where the course communication tools can be located, and 'Resources' – which is where further information relating to the content or software and hardware downloads can be found.
- The third menu item includes links to the learners' and instructor in the course, and is centered at the bottom of the screen. This menu includes three buttons, 'My Profile', 'Instructor Profile', and 'Who's Online'.

- The fourth and last menu bar is located center right of the screen. This menu bar can be thought of as a quick links toolbar, as it comprises of links to dynamic and web items, and those that the instructor assumes will be the most important to learners. It includes: a search tool; links to course messages including discussion board, personal messages and emails; link(s) to course news; and quick links to the course timetable, assignments, and downloads.

Colour is used to indicate actions and wayfinding, as indicted again in Figure 4.4.4a. For instance, this figure shows that the learner is 'Home', and that they have rolled their mouse over the Course Information button.

The main area of the screen is indicated by a white background centered on the screen, and is divided into three areas. The main area includes a Start Tips icon, a text and a video console, and a download bar with Feedback links below. The feedback link takes guests to the guest book, to provide feedback about the courseware. The text includes a personalised welcome to the learner from the course instructor, and instructions to click the play button of the video located beneath the text. The download bar to the right of the video console, include icons and text representing the format in which learners' would like to download a copy of the video presentation. The presentation reintroduces the instructor, it repeats relevant information from the First Time Tutorial, and includes other online learning notes intended to guide the learner in using the courseware. Again the instructor uses colloquial language and analogies, in order to encourage learners' to use the courseware effectively, and be successful eLearners. For instance, text of the presentation instructs learners to: utilise their preferred learning style, by downloading the content and learn in a way that suits the learner and their lifestyle; familiarise themselves with the courseware, by going to the site map and familiarising themselves with the content in each section;, and collaborate with other learners', by going to the Discussion Board, reading the information there and posting a welcome note to their classmates. Learners' are encouraged to be disciplined about setting time aside for their studies, and to utilise the communication tools to become part of a community of learners.

Figure 4.4.4a: Homepage

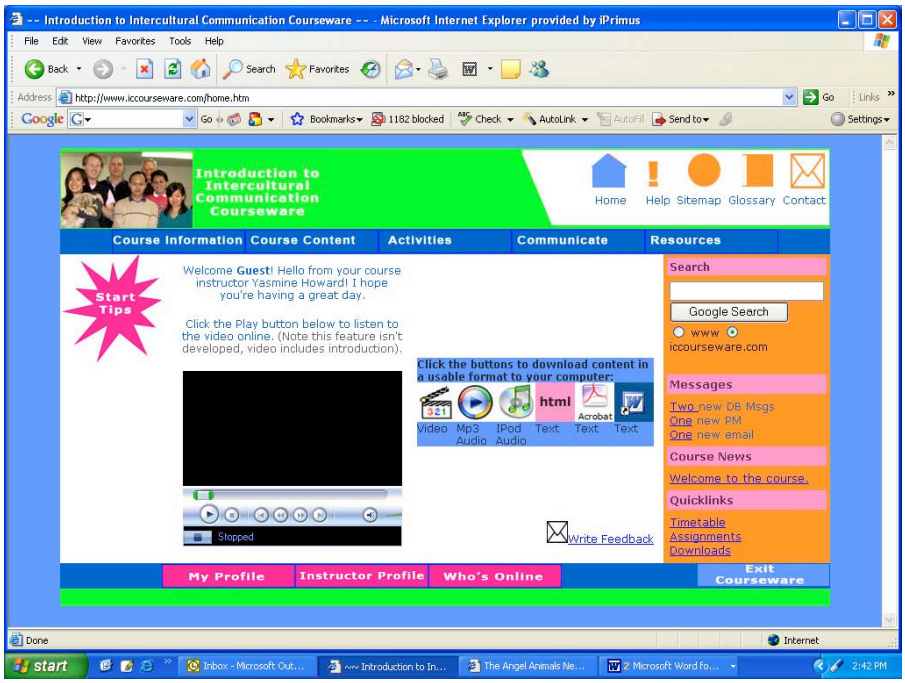
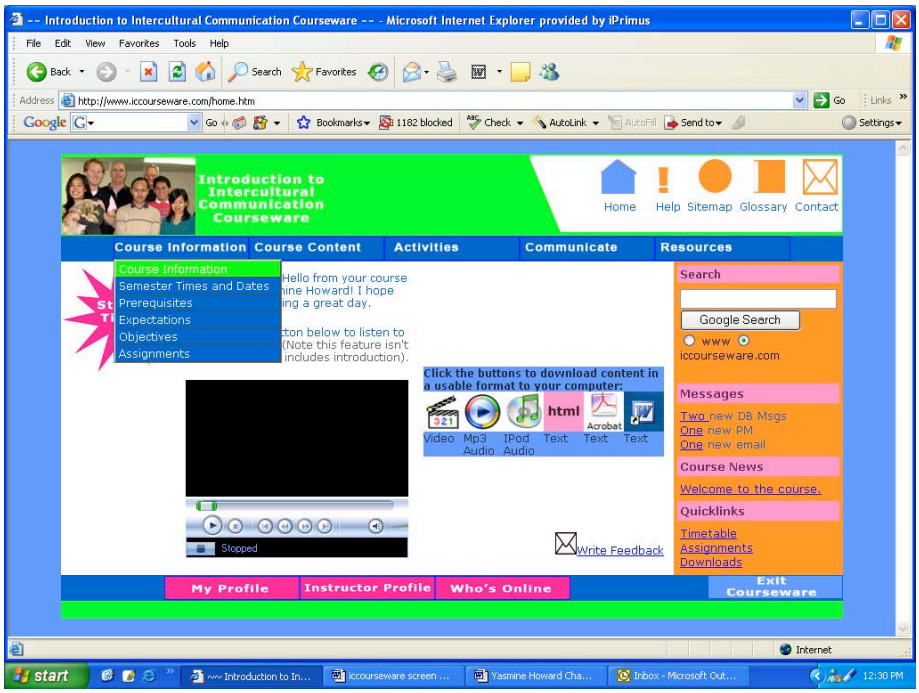


Figure 4.4.4b: Homepage with drop down menus



4.4.5 Navigational and Learning Aids

The Help screen is displayed below in 4.4.5a. It includes three hotspots, to ‘Content Help’, ‘Technical Help’, and ‘Other Help’. This information is displayed at the bottom of the same screen. A hyperlink labelled ‘Top’, will then take the learner to the back to the top of the page. For instance, clicking ‘Other Help’, will take learners to the screen as displayed in Figure 4.4.5b. Content Help provides learners’ with a list of suggestion solutions for help with the courseware content. Technical Help provides learners’ with suggested solutions if they’re

having issues with the hardware and software requirements of the course. Other Help is where the content of the First Time Tutorial is replicated.

Figure4.4.5a Help Screen

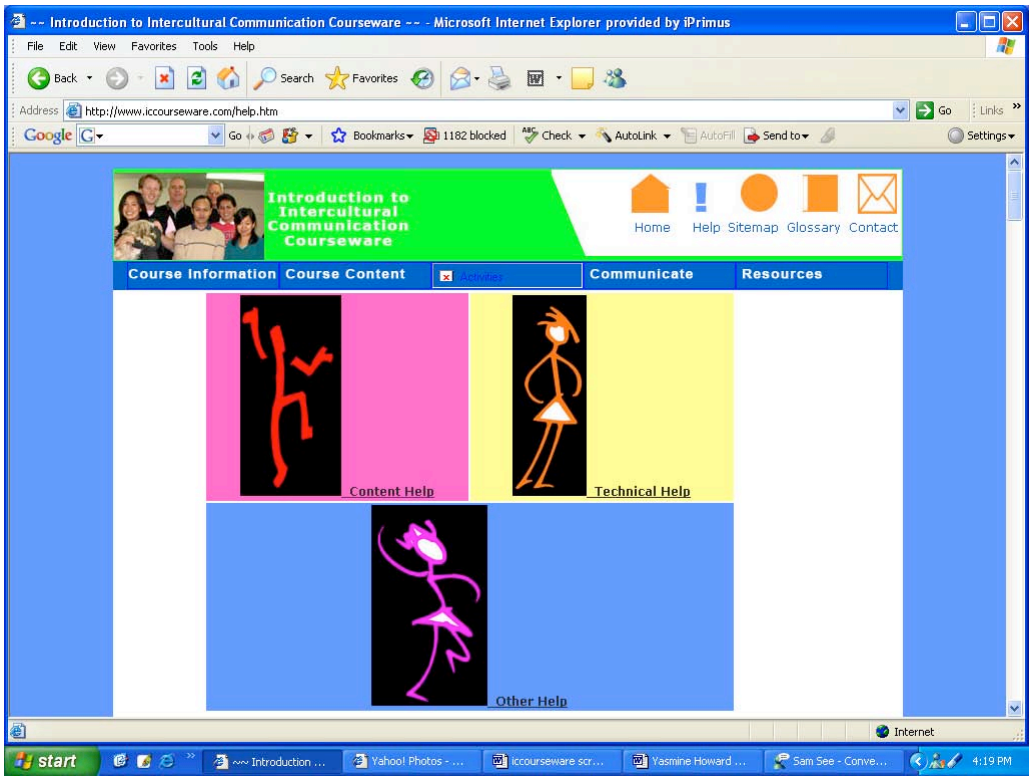
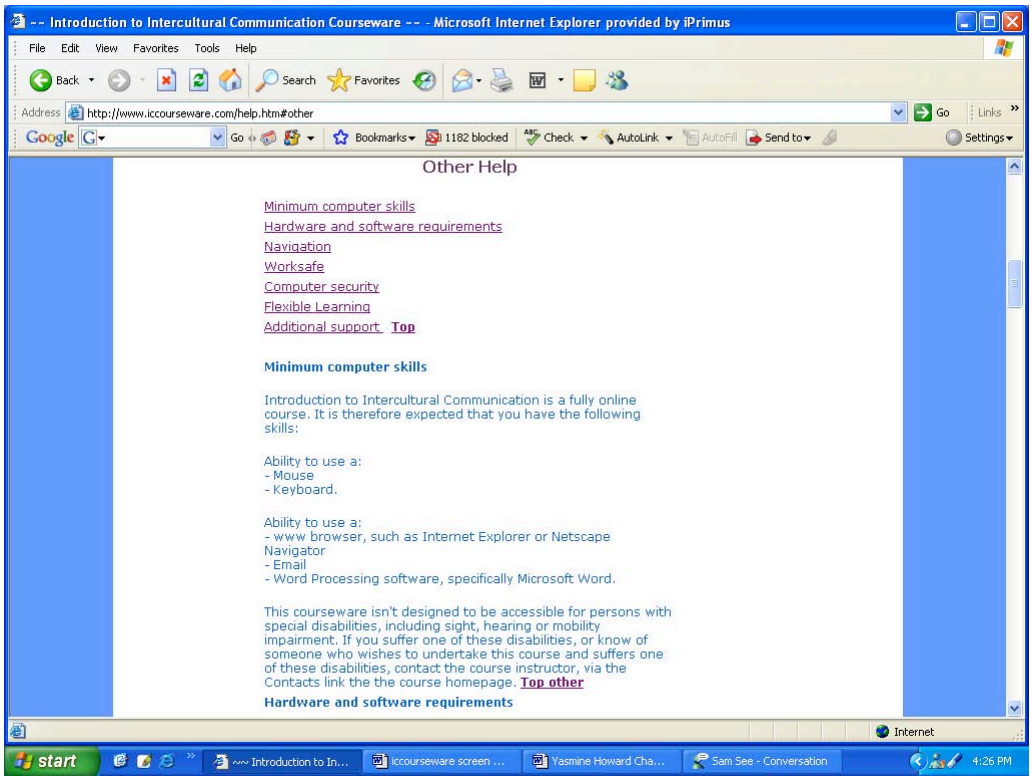
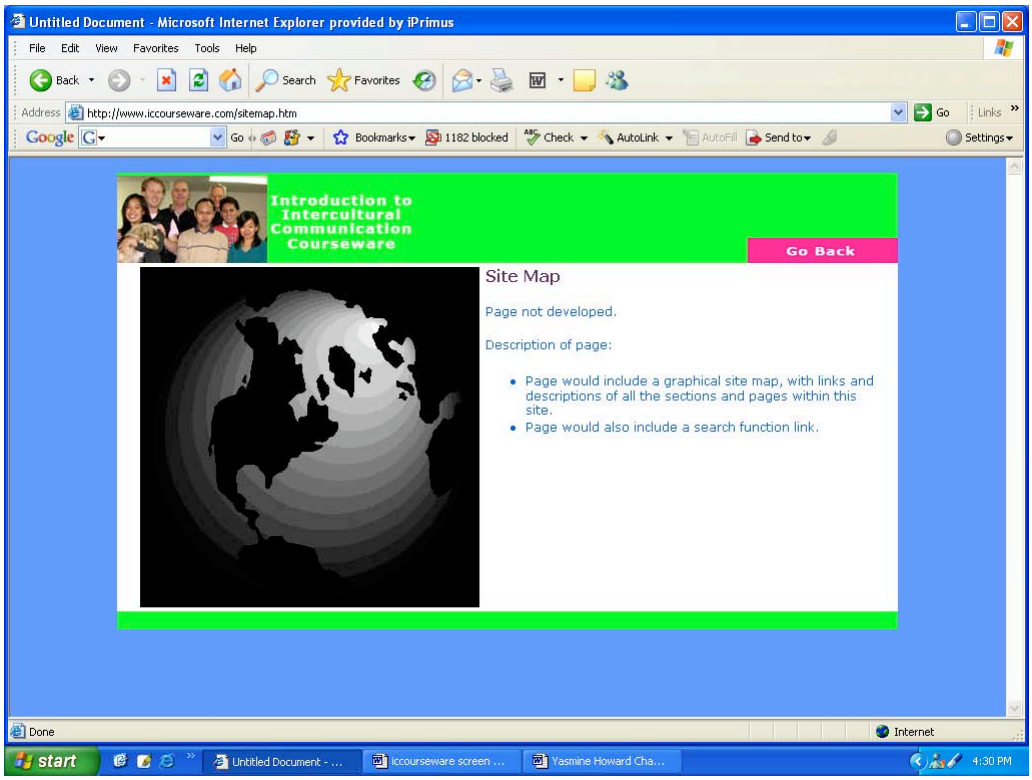


Figure 4.4.5b: Other Help



The Site Map screen is displayed in Figure 4.4.5c below. Evaluators of the courseware are advised that the page is not developed. The description of the page design if developed is as follows: “Page would include a graphical site map, with links and descriptions of all the sections and pages within this site. Page would also include a search function link.”

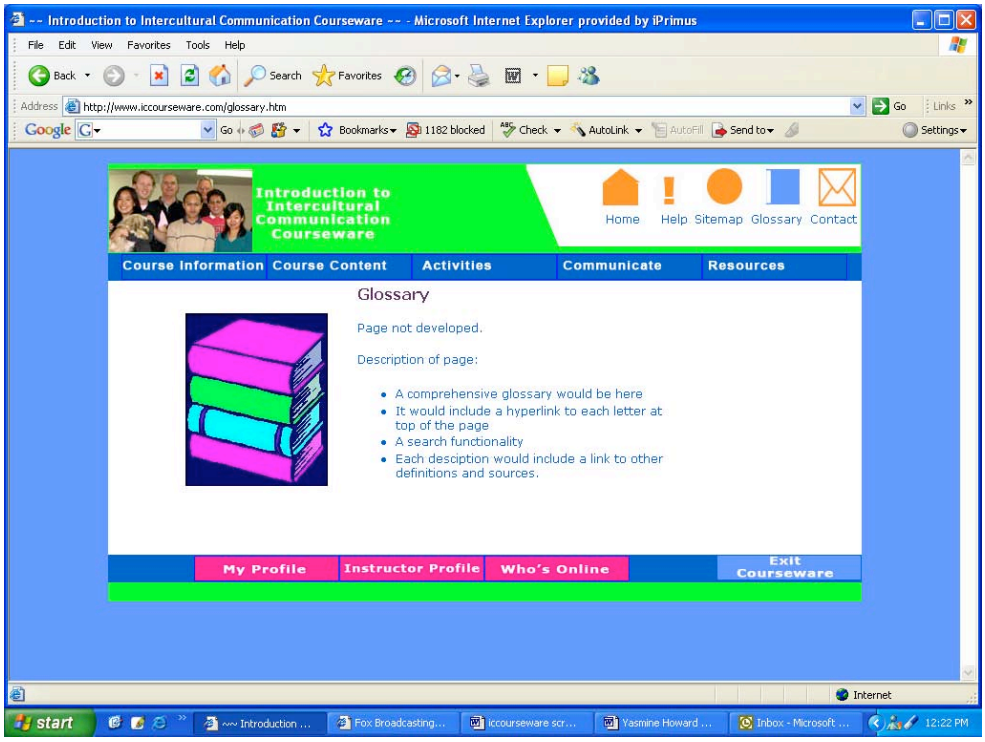
Figure 4.4.5c: Site Map



The Glossary screen is displayed in Figure 4.4.5d below. Evaluators of the courseware are advised that the page is not developed. The description of the page design if developed is as follows:

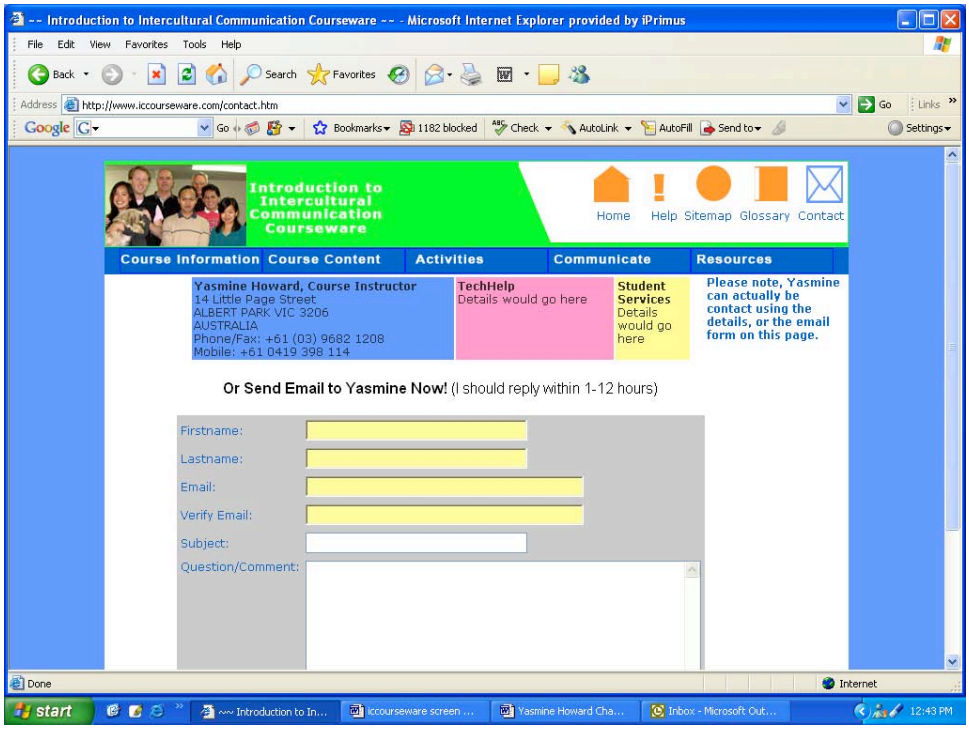
- “A comprehensive glossary would be here,
- It would include a hyperlink to each letter at top of the page, A search functionality
- Each description would include a link to other definitions and sources”

Figure 4.4.5d: Glossary



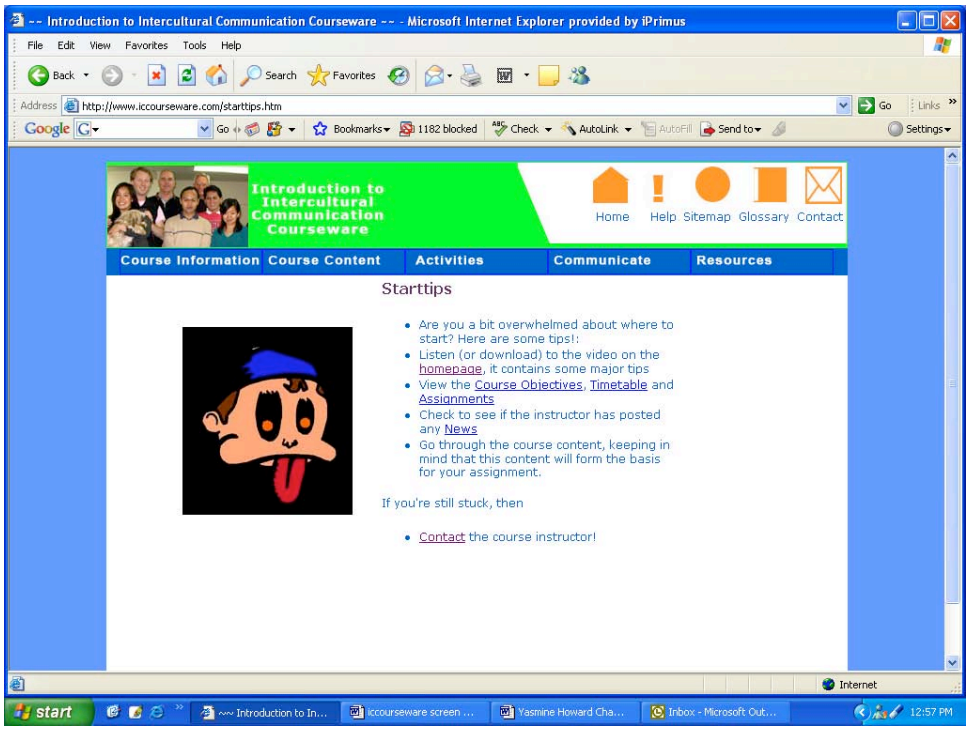
The Contact screen is displayed in Figure 4.4.5eAt the top of the content area is a table with three cells. The first cell includes the course instructor contact information, and the other two are intended for Tech Help and Student Services. Below this is an online form to the instructor, so learners' can contact the instructor immediately as opposed to taking additional steps to access and send email through their webmail. Learners' are advised that the instructor will provide feedback within 1 to 12 hours.

Figure 4.4.5e Contact



The Start Tips screen is displayed in Figure 4.4.5f below. The page includes a graphic and informational text intended to help the learner get started in using the courseware. Learners are advised to listen to the homepage video, view the course information, read the course news, and to go through the course content keeping in mind the content will form the basis for the assignments.

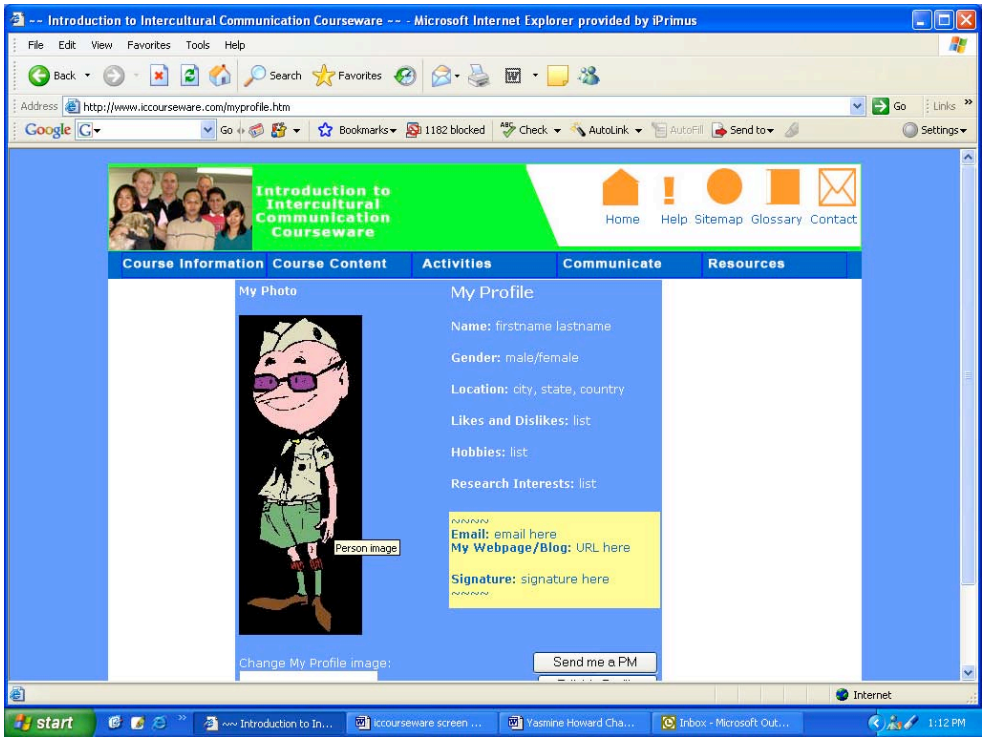
Figure 4.4.5: Start Tips



4.4.6 Learner and Instructor Screens

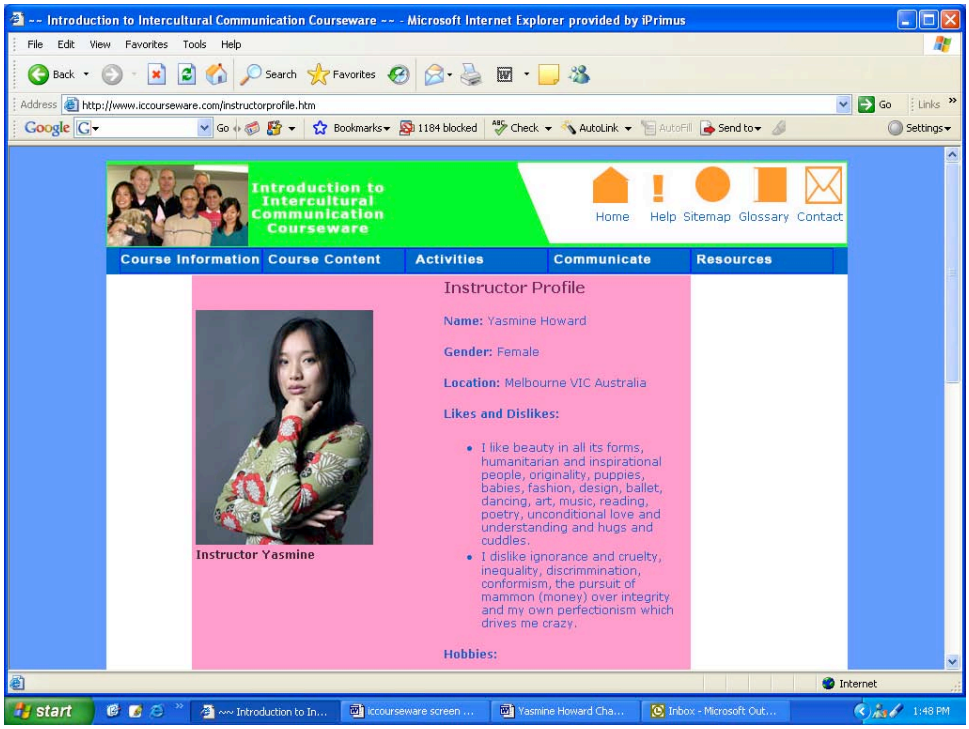
The learner and instructor screens are designed so enhance the sense of being in a virtual classroom. These screens enable learners' to easily contact their peers and lecturer in a variety of formats. Images and text spaces for personal information are included to enable personalisation of the courseware, and encourage learners' to become part of a community of learners. The My Profile screen is displayed in Figure 4.4.6a below. It includes a place holder image, and a tool to enable learners to insert their own image in this space. It also includes spaces for the learners' name, gender, location, likes and dislikes, hobbies and research information. A special text box space is included for the learners' to insert their email, webpage/blog, and to further personalise their profile by adding their signature. Two buttons are located below this text. One button is labelled Edit My Profile, and clicking this button enables learners to edit their profile. The other button is labelled Send Me a PM, and enable learners' to send themselves a personal message, such as a reminder note to undertake a task.

Figure 4.4.6a: My Profile



The Instructor Profile screen is displayed in Figure 4.4.6b below. It is a personal profile of the courseware instructor, including a static graphic of the instructor and text to the right. The text includes the instructor's name, gender, likes and dislikes, and research interests. A special text box space is located below this text, with the instructor's personalised Signature.

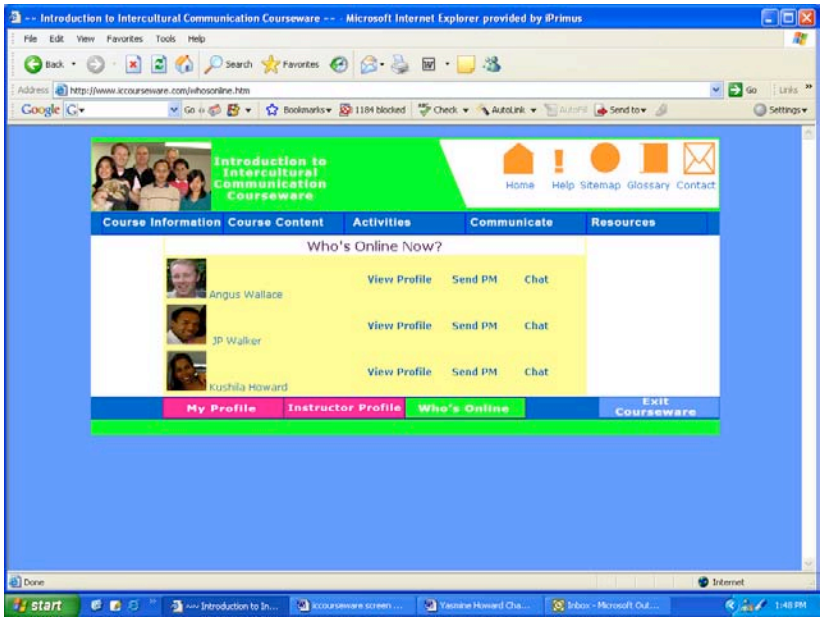
Figure 4.4.6b: Instructor Profile



The Who's Online screen is displayed in Figure 4.4.6c below. It shows who is online at the same time as the learner, and provides communication tools for the learner to contact these peers. These peers are displayed in a table. Each row includes a thumbnail photo of the

person online, their name, and three hyperlinks. One to the person's profile, the second to an online form to send the person a personal message (PM), and the third to the chat console in enable a real-time chat to the person.

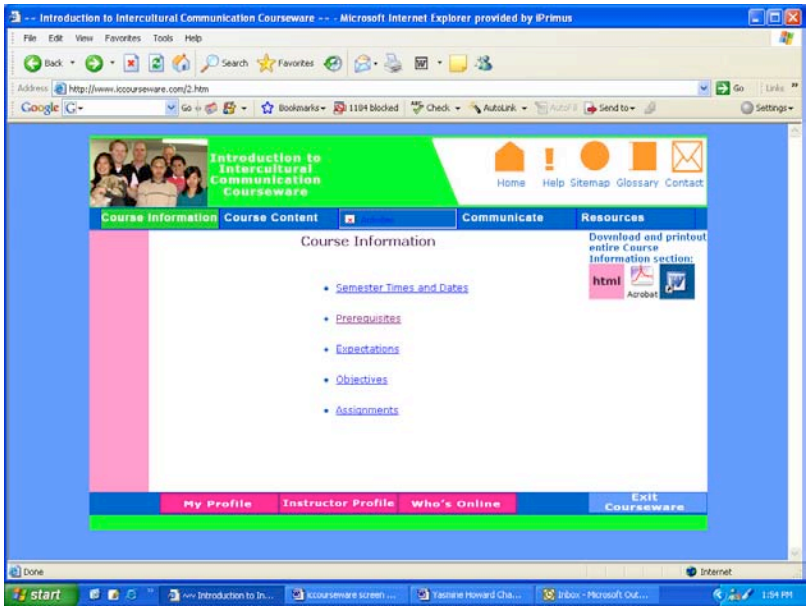
Figure 4.4.6c: Who's Online?



4.4.7 Course Information Screen

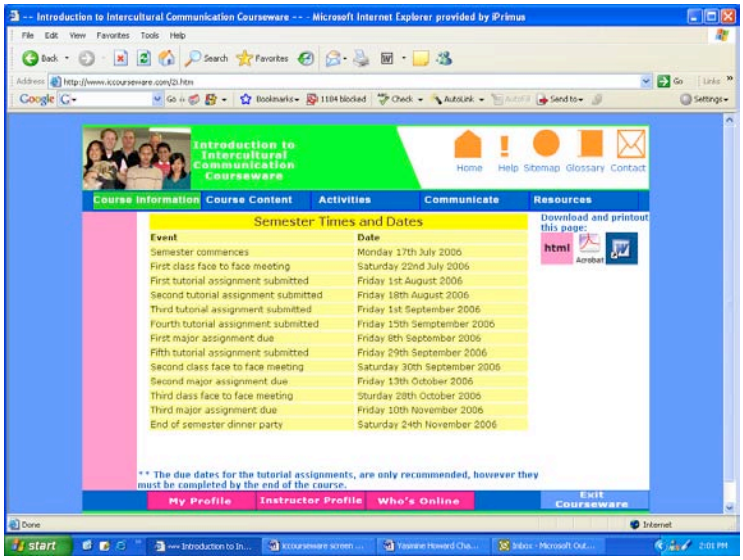
The course information section is where information about the course is located. The Course Information screen is displayed in Figure 4.4.7a below. It includes a list of topics in the section, each accessible as a hyperlink. The topics include 'Semester Times and Dates', 'Prerequisites', 'Expectations', 'Objectives', and 'Assignments'. There is a download toolbar located to the right of these hyperlinks. This toolbar includes three icons representing a different format for text downloads, and instructions to download and printout the entire course information section.

Figure 4.4.7a: Course Information



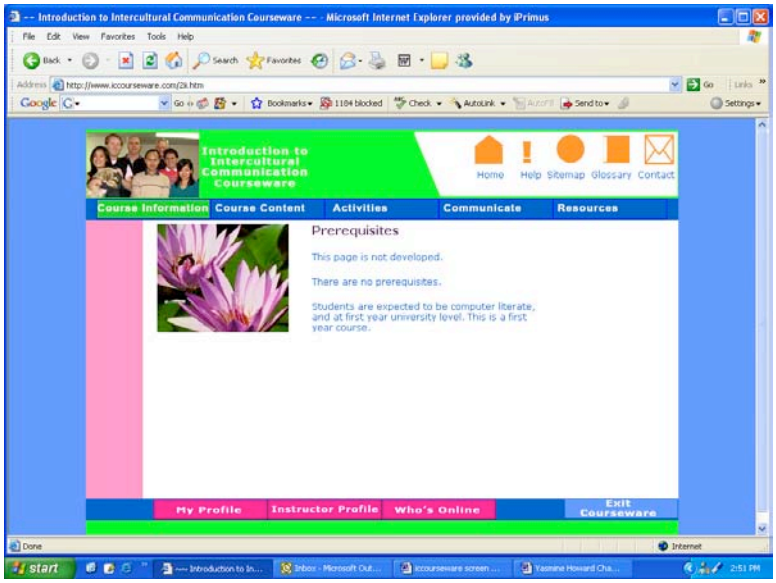
The Semester Times and Dates screen is displayed in Figure 4.4.7b below. It includes a table with two columns, the first listing the course event, the other the date relating to the event. Below the table is a note informing learners' that the dates for the tutorial assignments are only recommended, however they must be complete the assignments by the end of the course. There is a download toolbar located to the right of these hyperlinks. This toolbar includes three icons representing a different format for text downloads, and instructions informing learners' they can download and printout the page.

Figure 4.4.7b: Course Information: Semester Times and Dates



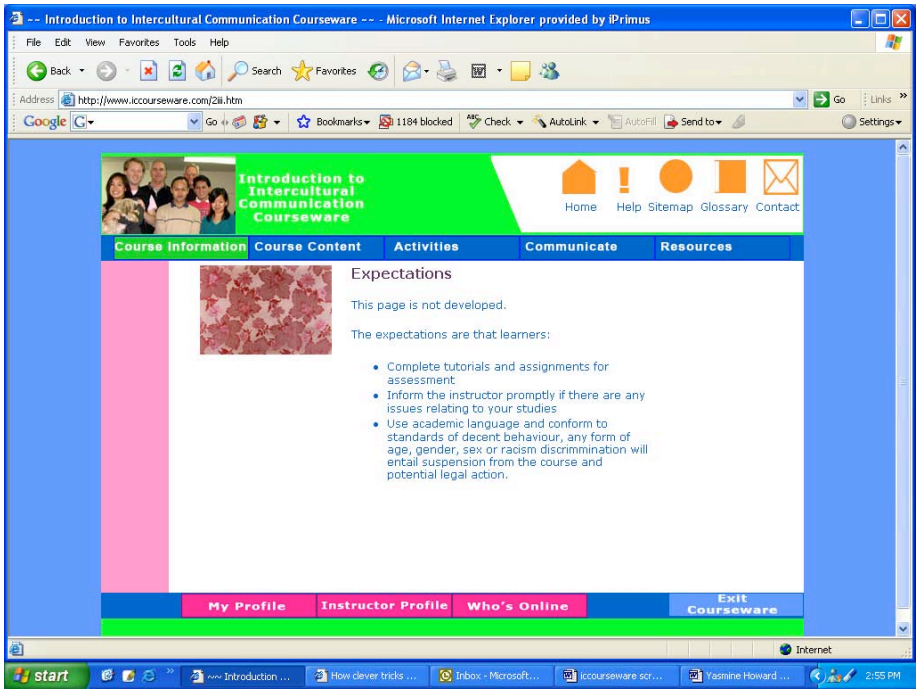
The Prerequisites screen is displayed in Figure 4.4.7c below. It is not fully developed. It includes a static graphic on the left, and text to the right. The text informs learners' that there are no prerequisites for the course, however students' are expected to be computer literate. There is a download toolbar located to the right of the table. This toolbar includes three icons representing a different format for text downloads, and instructions informing learners' they can download and printout the screen.

Figure 4.4.7c: Course Information: Prerequisites



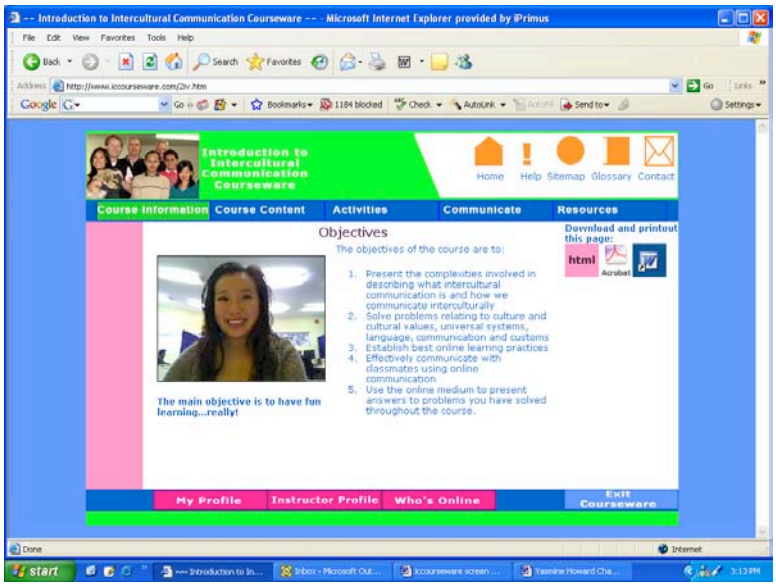
The Expectations screen is displayed in Figure 4.4.7d below. It is not fully developed. It includes a static graphic on the left, and text to the right. The text informs learners' that it is expected that learners' complete tutorials and assignments for assessment, inform the instructor promptly if there are any issues relating to your studies, and use academic language and conform to standards of decent behaviour. Learners' are informed that any form of age, gender, sex or racism discrimination will entail suspension from the course and potential legal action'. This information is particularly important given the that learners' identify and personal information is identifiable and part of the courseware.

Figure 4.4.7d: Course Information: Expectations



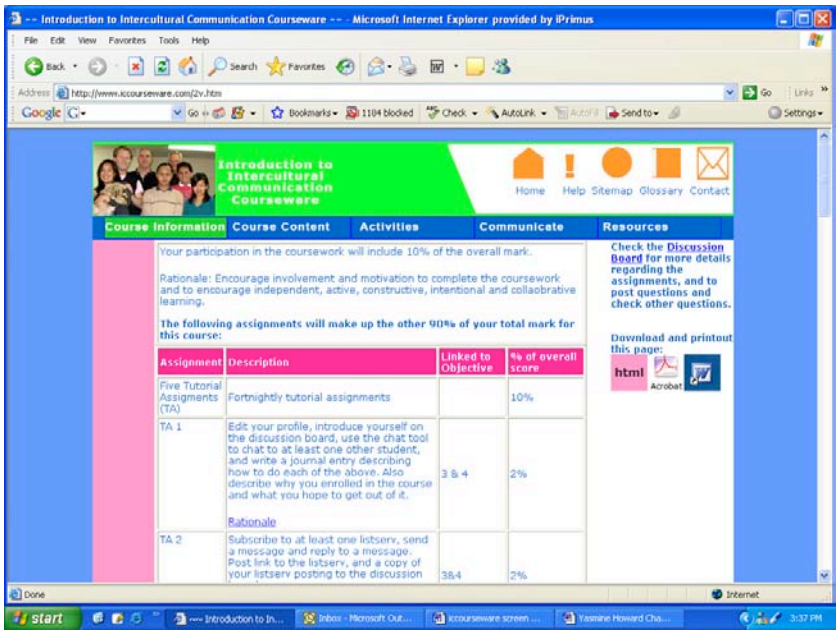
The Objectives screen is displayed in Figure 4.4.7e below. It includes a static graphic of the instructor, with the text "the main objective is to have fun learning…really!" The text on the screen lists five objectives. The objectives are designed to be open-ended, so that the learner may contribute in co-constructing the objectives and how they're achieved. The first objective encourages learners' to actively construct their own definition of intercultural communication and represent its complexities. The second objective involves learners' to solve ill-structured problems relating to each of the course content areas. The next three objective relate to using the online medium effectively, as this is a crucial element in effective eLearning. The third objective is to establish best online learning practices. The fourth objective is to effectively communicate with classmates using online communication. The fifth and last objectives is to use the online medium to present answers to problems learners' have solved throughout the course. There is a download toolbar located to the right of the screen. This toolbar includes three icons representing a different format for text downloads, and instructions informing learners' they can download and printout the screen.

Figure 4.4.7e Course Information: Objectives



The Assignments screen is displayed in Figure 4.4.7f below. It includes text information, followed by two tables. The text informs learners that their participation in the coursework comprises ten per cent of their overall mark. Learners' are also provided with a rationale, which is as follows: "Encourage involvement and motivation to complete the coursework and to encourage independent, active, constructive, intentional and collaborative learning." The first table includes a list of assignments, their objectives, which objective the assignments are linked to, and what percentage of the overall score the assignment comprises. Learners' are informed that the assignments comprise 90% of their overall score. There is no exam for the course as it assumed that the coursework and assignments are sufficient indicators of student progress. There is a download toolbar located to the right of the screen. This toolbar includes three icons representing a different format for text downloads, and instructions informing learners' they can download and printout the screen.

Figure 4.4.7f: Course Information: Assignments



The course content section is where the main body of content for each of the five course content areas is located. The five course content areas are: ‘Culture and Cultural Values’; ‘Universal Systems’; ‘Language’; ‘Communication’, and; ‘Customs’. The Course Content screen is presented in Figure 4.4.7g below. It includes a static graphic of the course instructor with a coffee mug, with the sub-text “Grab a coffee, get some munchies, and start browsing!” A list of hyperlinks to the course content topics is located to the right of this graphic. Only the section on Culture and Cultural Values has been designed and developed. If learners’ enter any other screens in the section, they are informed that the screen is not developed, and provided with a hyperlink to the Culture and Cultural Values screen. This is shown in Figure 4.4.7h below.

Figure 4.4.7h Course Content

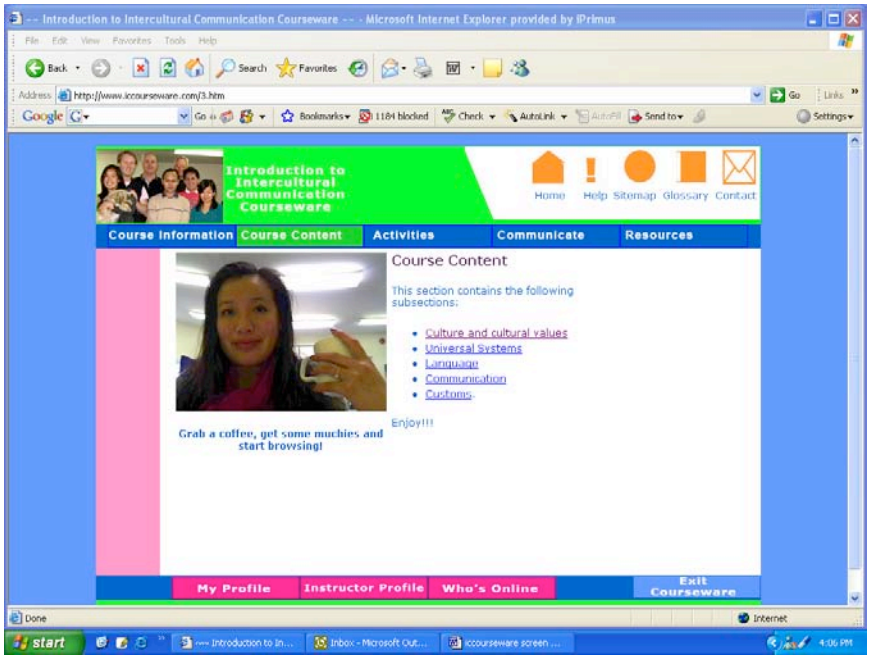
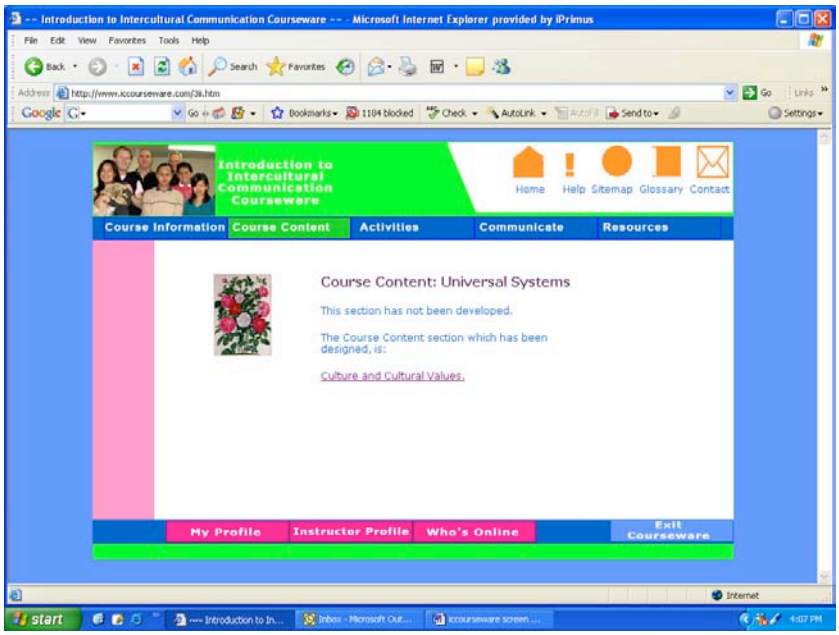
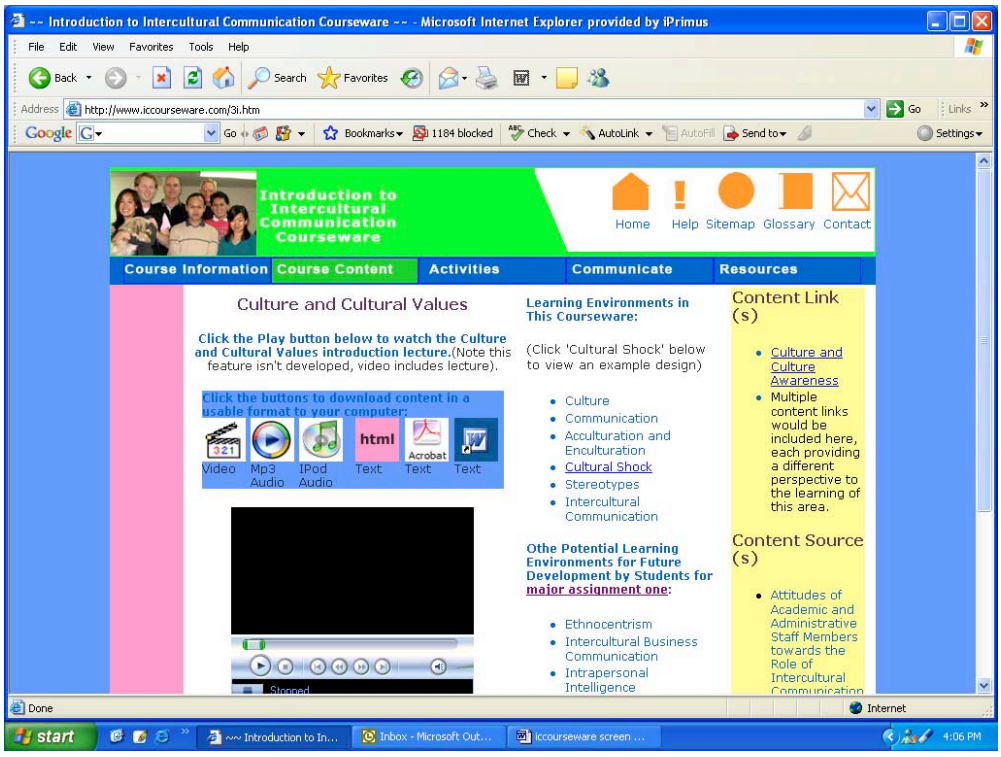


Figure 4.4.7h: Course Content: Universal Systems



The Culture and Cultural Values screen is displayed in Figure 4.4.7i below. The course content screens would all follow this design, with only the content differing across each screen. The left of the screen includes text instructions guiding learners' to watch the video introduction on the topic. Below this is the download bar, which includes icons and text representing the format in which learners' may like to download a copy of the video presentation. The video console follows this. The video itself is a virtual lecture introducing learners' to intercultural communication, and major theories and components of Culture and Cultural Values. The center of the screen includes two rows. The heading of the first row is titled 'Learning Environments in This Courseware'. There are six learning environments beneath this, each of which would be available to learners should the courseware be fully developed. Each of these environments covers relevant areas of the Culture and Cultural Values topic. These learning environments serve as working examples of constructivist learning environments (CLEs), and related cases for the first major assignment. Only the CLE on Cultural Shock has been developed for participant and guest evaluators to view. Below this are a list of suggested learning environments for learners' to develop, and a link to the description of the first major assignment. This list also serves as a summary of sub-topics within the topic area. The right of the screen includes content links to a range of relevant resources for the topic, each resource providing a different perspective of the topic.

Figure 4.4.7i: Culture and Cultural Values



The Cultural Shock screen is displayed in Figure 4.4.7j below. As mentioned above, this screen is based on Jonassen's research for the design of CLEs. Learners' are presented with an authentic real-world problem relating to cultural shock. There are questions designed to engage them in an active and reflective dialogue with issues relating to this cultural shock problem. There are also analogies and resources relating to the domain content to facilitate

the construction of their answers. The main focus of the screen is a thumbnail graphic of a woman named ‘Stacy with her daughter Rose, and text which contextualises an authentic real-world problem relating to Stacey. This text is as follows:

> “Stacy is a 30 year old mother living in Melbourne Australia. She has just returned to work, after 18 months off after the birth of her daughter Rose. Stacey works for a major corporation, whom have offices in Melbourne, Sydney, London and New York. The company are expanding, to include offices in Beijing and Tokyo. They would like to send Stacey to Beijing for one month, to help set up the office. Stacey has only ever travelled to London, New York and Fiji (for her honeymoon), and she has never really had the opportunity to mix with persons of Asian culture.”

Learners’ are then presented with the problem, and four questions relating to the problem. The problem is: “Stacey has decided to take the job up, because she has been offered a significant amount of money, that will help pay for Rose's education in the future.” The first question asks learners’ what aspect of cultural shock they think Stacey will have. The second question asks which of the five stages of cultural shock they think Stacey will experience, and how? The third question asks what suggestions learners’ would make for Stacey to alleviate cultural shock. The final question asks learners’ to reflect on whether they have ever experienced cultural shock, and if so when, how and why. Learners’ are encouraged to post their answer on the discussion board, and are prompted to collaborate by providing feedback on one of their peers’ answers. They are provided with a rationale for the learning task, which is as follows: “Independent learning and constructive, collaborative, conversational, reflective, contextualized, complex learning.”

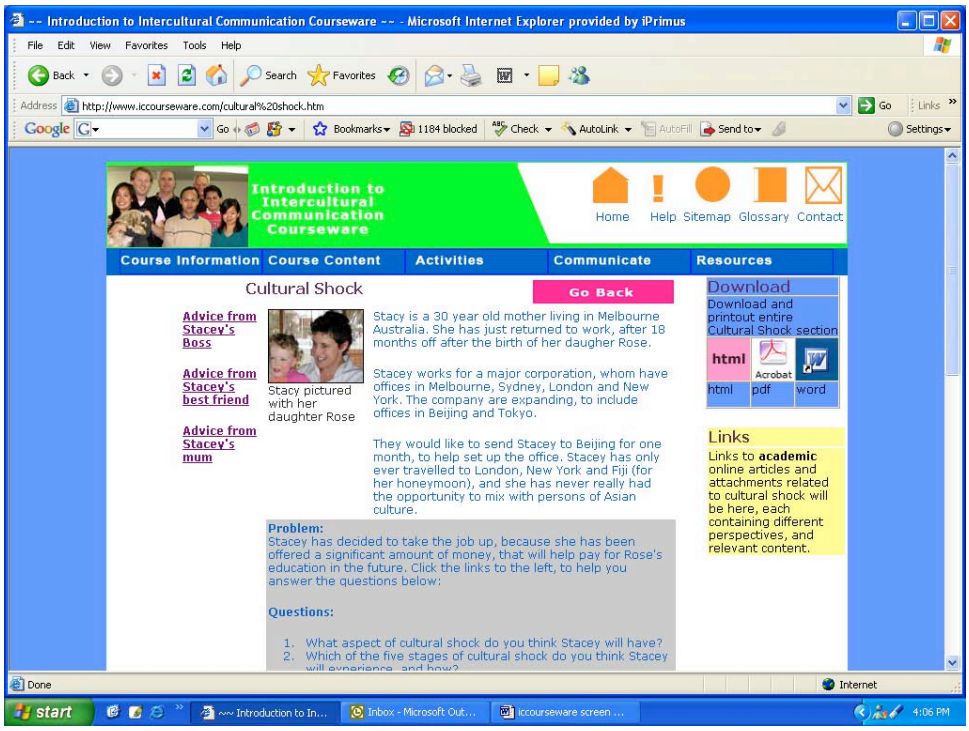
Analogies in the form of advice, are located to the left of the screen, and are intended to facilitate learners’ answers to the first three questions. For instance, advice from Stacey’s boss helps answer question one, advice from Stacey’s best friend helps answer question two, and advice from Stacey’s mum helps answer question three. The advice is as follows:

> “Stacey's boss Tim gives her advice, based on his experiences. He refers to a book by Engholm on AsiaShock, in which Engholm identifies the five progressive stages of AsiaShock experiences by U.S travellers. Stacey's best friend Sandra tells her about her experience of cultural shock, inadvertently referring to each of the five stages of cultural shock. Stacey's mum offers her advice on how to alleviate cultural shock. She refers to a couple of books Stacey should read on the matter.”

Stacey’s boss and mother also act as coaches, by guiding her towards relevant texts. These and related resources are provided as links to the right of the screen. There is a download bar located above these resources. This includes icons and text representing the format in which learners’ may like to download a copy of the text of this screen. Effectively, the CLE enables the learner to cover the main elements of cultural shock, and facilitate a deeper learning process through actively engaging in an authentic real world problem relating to this

topic. Meaning-making is further deepened through the process of learners reflecting on cultural shock, as it applies to their real-world situation. It is anticipated that learner motivation will be further highlighted as participation in the courseware makes up a percentage of learners' overall score.

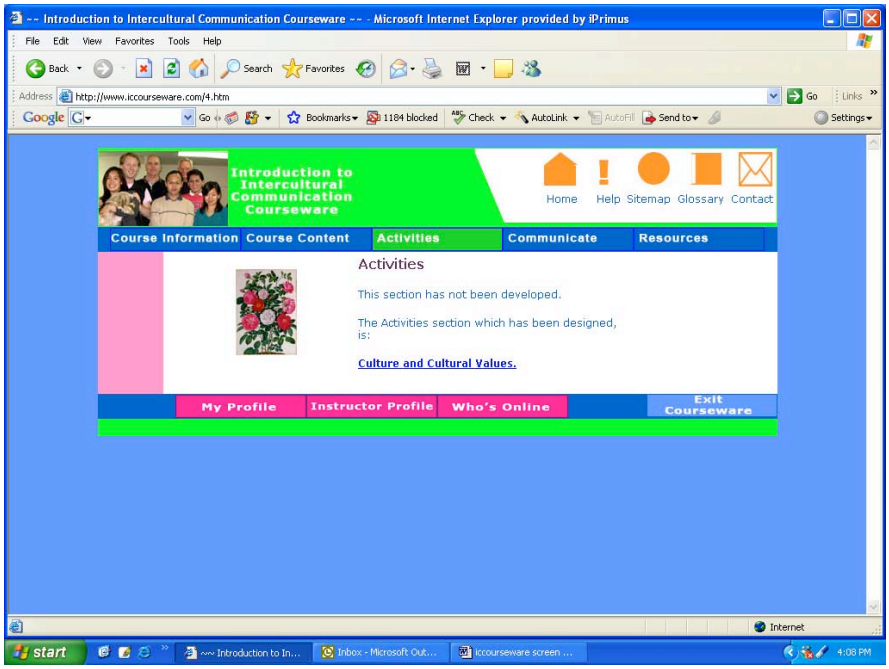
Figure 4.4.7j: Course Content: Activities



4.4.8 Activities Screen

Juxtaposed to the Course Content drop-down menu is the Activities menu, whose menu items mirror the Course Content's. This section includes a range of games-based activities, reflecting both lower and higher level learning for each topic. There are four reasons for including a range of activities for section. Firstly, to act as self-tests of domain content. Secondly, to supplement the course content through additional case study examples. Thirdly, to better motivate learning through engaging educational games. Lastly, to provide alternative structures for covering key content. The Activities screen is displayed in Figure 4.4.8a below. Participant and guest evaluators are informed that the section has not been developed, and referred to the Culture and Cultural Values screen within the Activities section

Figure 4.4.8a: Activities

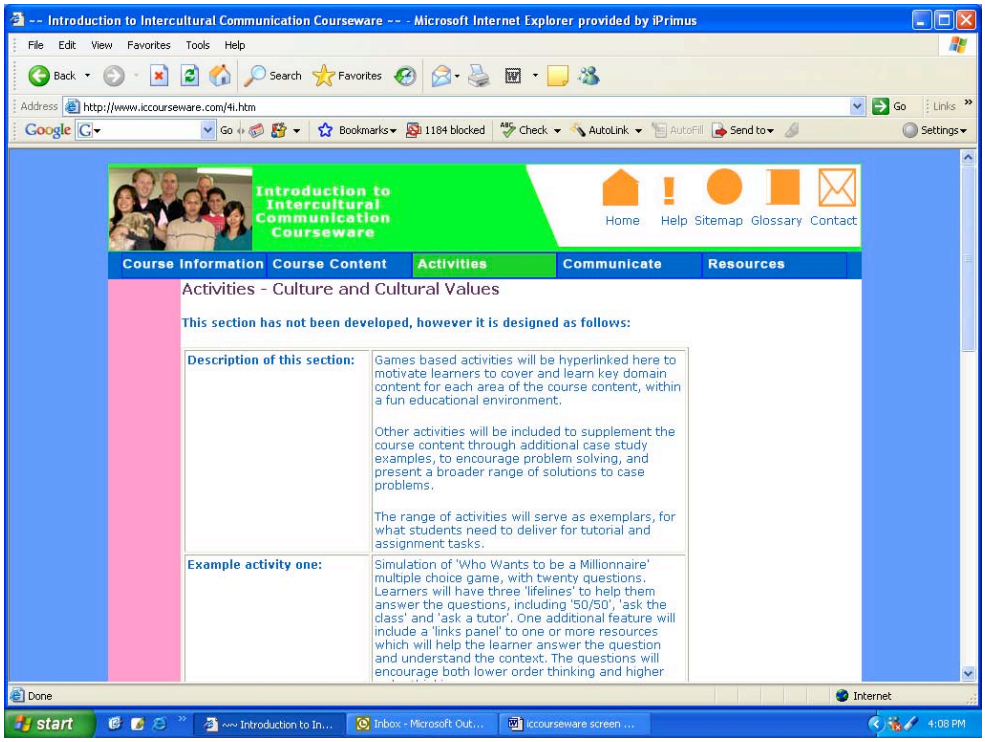


The Culture and Cultural Values screen within the Activities section is displayed in Figure 4.4.8b below. Evaluators are informed that the screen is not developed, however they are provided with a description of the section – as discussed above, and two example activities. The first example activity is a simulation of a 'Who Wants to be a Millionaire' multiple-choice game, with twenty questions. Learners will have three 'lifelines' to help them answer the questions, including '50/50', 'ask the class' and 'ask a tutor'. One additional feature will include a 'links panel' to one or more resources, which will help the learner answer the question and understand the context. The questions will encourage both lower order thinking and higher order thinking. Examples questions could be: which author wrote this definition of intercultural communication?; which of the following are not examples of stereotypes?, and; which of the following are examples of intrapersonal intelligence?". The rationale behind the design of this activity is to help learners test their understanding of key content areas, to motivate learners through fun, within an educational context, and to provide learners with an alternative means of covering key content areas.

The second example activity listed is a 'drag and drop activity' where learners will be presented with a question, and four possible answers. They may choose which answer is correct, by dragging the selected answer into a target 'drop box' on the screen. The question will be written in the context of a real-world situation, involving 'real-world' people. Each question will have multiple solutions, however one solution may be regarded as 'more correct' than other solutions. The learner will be given feedback that presents the potential outcomes of their choice, as well as encouraging them to understanding why their choice may or may not be more correct. The rationale behind this activity is to encourage knowledge construction through the active manipulation of online tools, to present the complexities of

real-world problems relating to Culture and Cultural Values, to scaffold learners to a ‘more right; answer, and to provide a related case as a reference for the first major assignment topic.

Figure 4.4.8b:Activities: Culture and Cultural Shock



4.4.9 Communicate Screens

The Communicate section includes tools to enable learners’ to make personal notes, collaborate with their peers, and communicate with their instructor. There are four different communication tools available to learners. The Communicate screen is displayed in Figure 4.4.9a. It includes a static graphic, and hyperlinks to each of the four communication tool screens. Only the Discussion Board screen has been designed. This is displayed in Figure 4.4.9b. The tools and their functionality are described below: ‘

- My Journal: An online notepad to enable learners’ to write journal notes, organise and search for journal notes by subject, month and priority, allow learners’ to embed html, images, video and voice, and allow learners’ to choose whether or not to share their journal or keep it private.
- Discussion Board: An online discussion board for asynchronous communication. Topics include ‘How to use this discussion board’ – including ‘Netiquette’, ‘Course News’, ‘FAQs’, ‘Student Chat Area’ – for non-course related chit chat, ‘Topic Discussion Questions’ – for discussion relating to each of the five topic areas, ‘Tutorial Discussion Questions’ – for discussion relating to each of the five tutorial tasks, and ‘Assignment Discussion Questions’ – for questions relating to each of the three assignments. Learners’ may also view Who’s Online, through this interface. There are also two hyperlinks, one to a list of members (students) – as shown in Figure 4.4.9c,

and the other to a list of member groups – as shown in Figure 4.4.9d. These are the groupings for the second assignment task, which will entail peer-to-peer group collaboration. Learners' will be able to view and contact their peers via personal message or chat through these pages.

- Chat: This tool enables learners' to communication asynchronously. Learners' may chat one on one, chat in groups, chat in specific group rooms, enable text only chat, allow video and voice chat (if they have a webcam), personalise their chat by uploading avatars, and share files.
- Email: Learners' will automatically login to their email, once they've signed in to the courseware. The email interface includes Inbox, Outbox, Sent Mail, Drafts and Address Book, and there is protection against Spam.

Figure 4.4.9a: Communicate

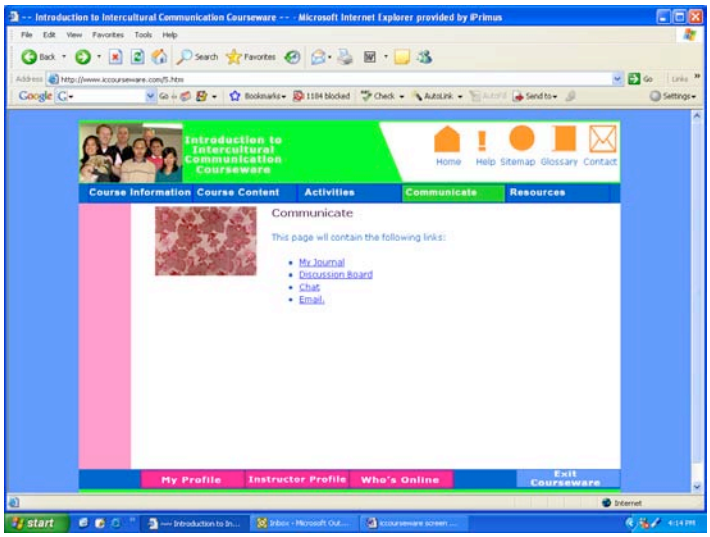


Figure 4.4.9b: Communicate: Discussion Board

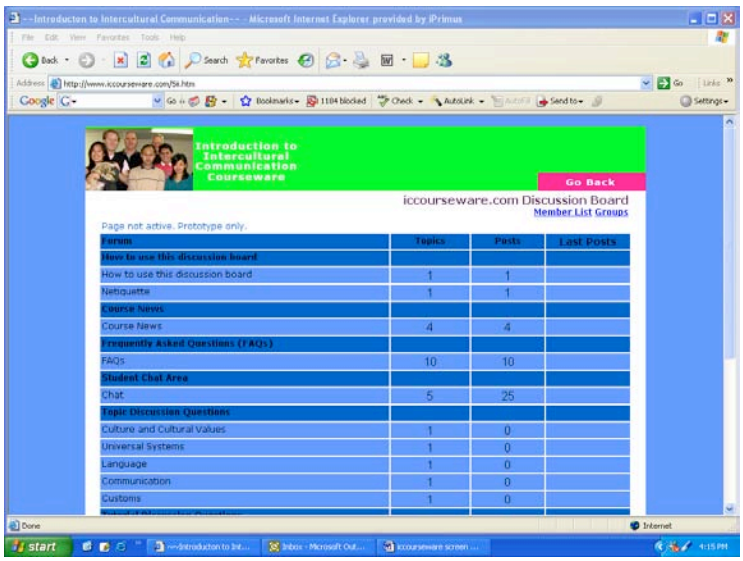


Figure 4.4.9c: Communicate: Member List

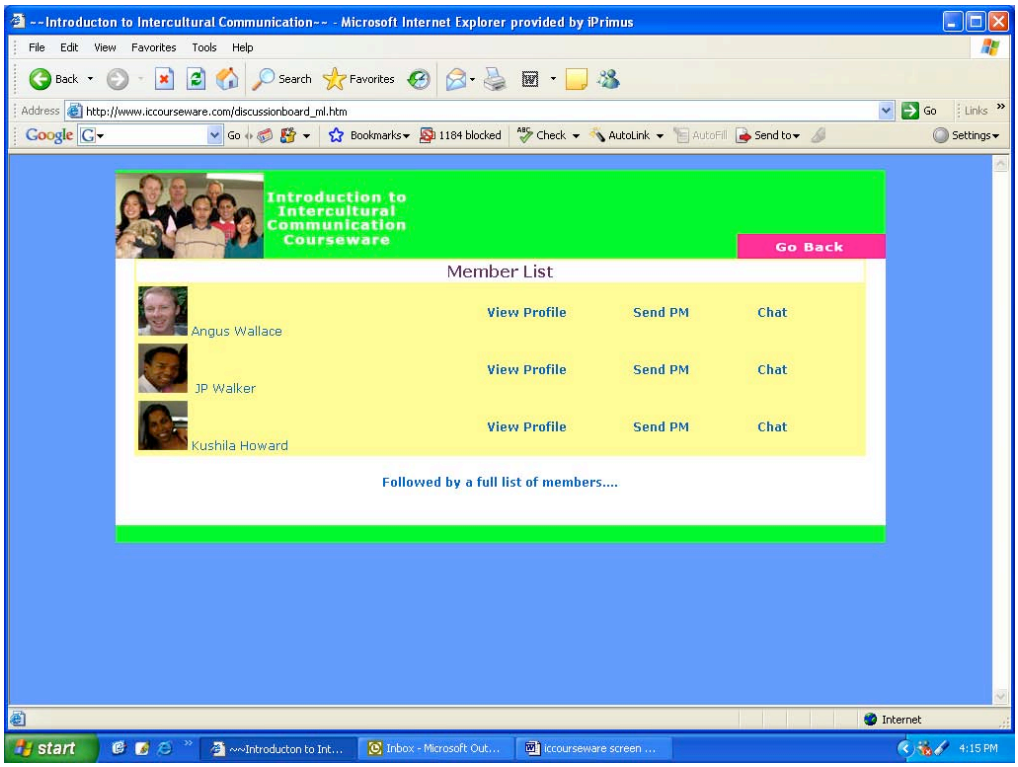
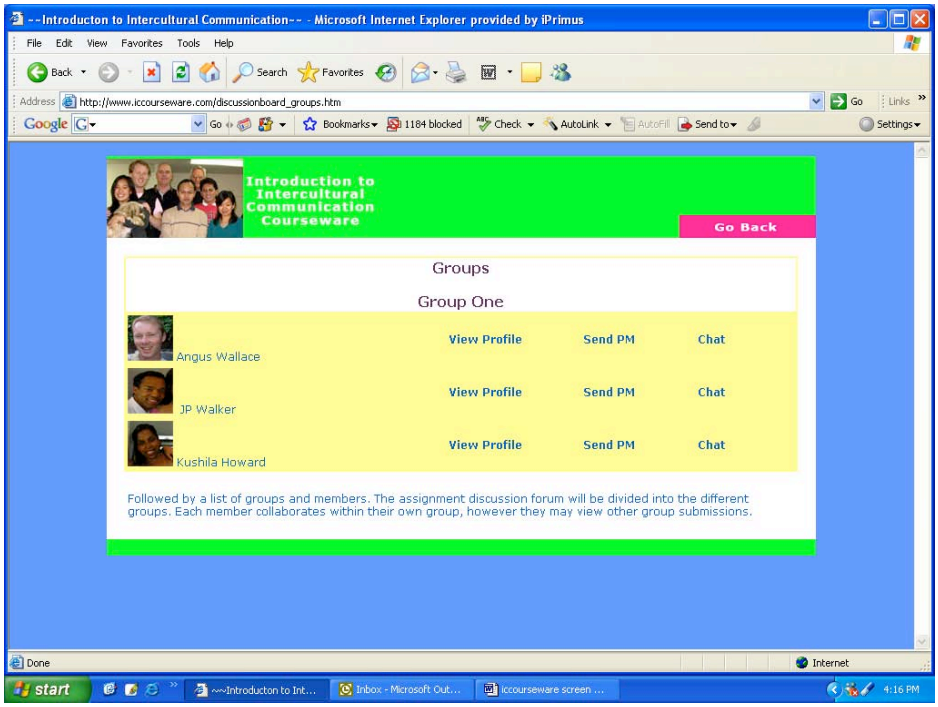


Figure 4.4.9d: Communicate: Groups –Group One



4.4.10 Resources Screens

The Resources section is where learners' may locate a range of resources to obtain course reference material, further information relating to the course content, or download relevant available freeware (software). The Resources screen is displayed in Figure 4.4.10a below. It includes a static graphic, and hyperlinks to pages within the section. Of the resources'

screens, only the Print Based screen has been developed. The resource screens and their functionality are described below:

- Online: This includes links to URLs associated with Intercultural Communication, links to podcasts and videocasts associated with Intercultural Communication, and links to listservs along with a description of their functionality. Also, a link where learners' can submit relevant URLs.
- Print Based: This includes a list of print-based texts relating to Intercultural Communication, as shown in Figure 4.4.10b.
- Library: The library screen includes a link to the university library associated with the courseware provider, a link to other university libraries, and a link to a range of online libraries, databases and search engines.
- RSS: An RSS reader receives updated articles from a range of selected web sites. The RSS screen includes a link to an RSS reader, a description of what the function of RSS readers are, and a list of relevant sources to add to RSS feeds.
- Downloads: This screen includes a list of all the video/voice/text downloads available in this courseware, a list of freeware downloads, and a list trial software that learners' may download and purchase online.

Figure 4.4.10a: Resources

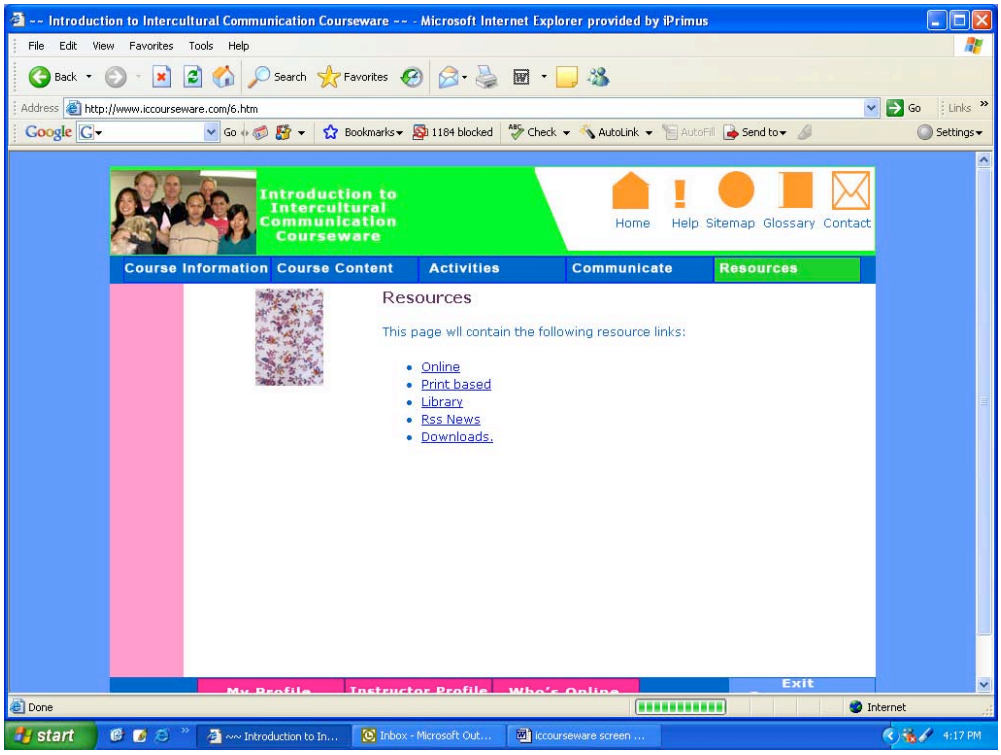
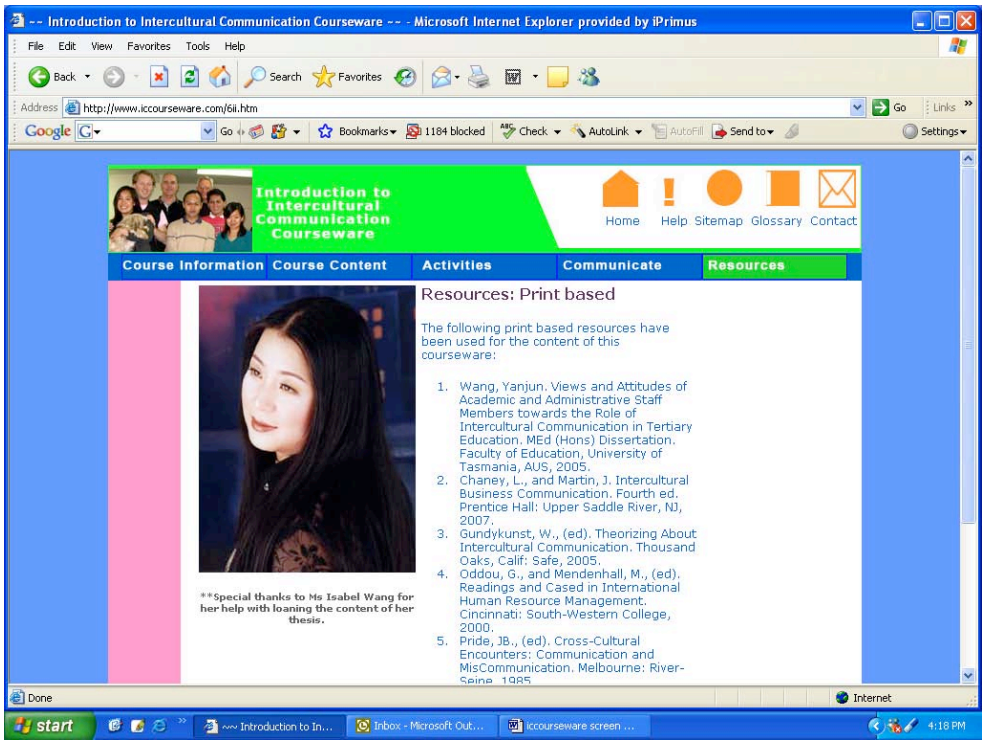


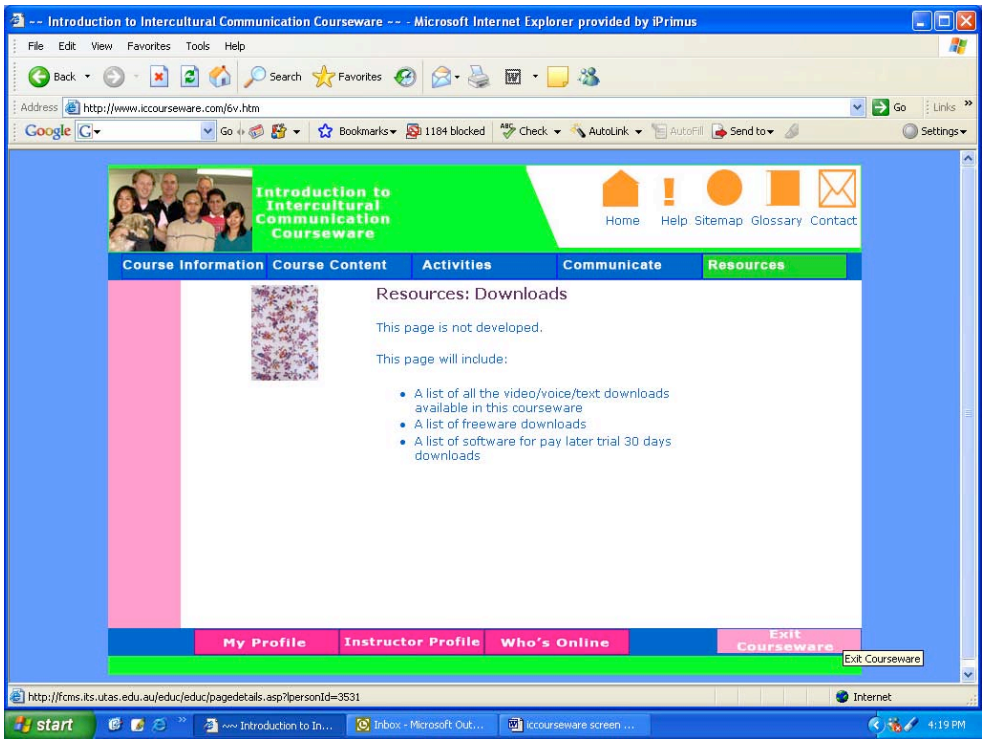
Figure 4.4.10b: Resources: Print Based



4.4.11 Exit

The exit button is located on the bottom right of every screen, as show in Figure 4.4.11a. It enables learners' to exit the courseware from any screen they are currently on.

Figure 4.4.11a Exit (bottom right button)



4.5 Conclusion

The design of the courseware is an important component of this research. This chapter has described some of the relevant literature on the practical elements of designing the prototype courseware, and provided an overview of how this literature was interpreted in practice by the researcher. It is worth mentioning however, that although the researcher generally followed the design guidelines from the literature, its interpretation was wholly the researchers. In some cases the researcher deviated from the traditional design, in particular through the use of colour. Rather than include muted hues, as traditional guidelines state, the researcher used brighter hues in an attempt to motivate participants through 'fun colours'. Many of the screens from the prototype were then shown, and a brief description of their design and/or intended use was provided. The courseware design comprises a range of user-friendly and learner-friendly design features, which are intended to better support effective online learning and motivation. These include an explicit consideration of: the technical constraints impacting upon usability; harmonious screen design; useful navigational aids; effective learning aids through the First Time Tutorial for example; a flexible and open-ended navigation; the support of different learning styles and successful online learning through multimedia downloads and analogies; personalisation of the courseware through the adaptive features such as those in the Personal Profile page; and a constructivist-based pedagogy in which the assignments work as task-based goals, and a range of related cases, just-in-time resources, collaboration tools, resource tools, and educational games are provided to support learners' active meaning-making from lower to higher order thinking. Multimedia downloads have also been provided to support effective usability and different learning styles. Finally, the instructor in order to scaffold and coach learners' knowledge construction has provided colloquial language and frequent real-world analogies. The Qualitative Analysis chapter will provide an overview of the courseware evaluation. The next chapter discusses the quantitative analysis from the questionnaire data.

Chapter 5: Quantitative Analysis

5.1 Introduction

This research utilises both quantitative and qualitative analysis. Chapter Three provided an overview of the mixed-methods data methodology utilised in this research. It is anticipated that the mix of quantitative and qualitative measures, will enhance the validity and reliability of this research. This chapter deals with the analysis of the questionnaire. The questionnaire itself is divided into three sections. Numeric data from the questionnaire was entered into the SPSS statistical software package. This data came from the first two sections of the questionnaire. This includes the independent (non-changing) variables of participants' 'occupation, age, institution, familiarity with teaching and learning online, and computer literacy'. It also includes the dependent variables (questionnaire items), which were grouped by theme and sub-theme. The four overall themes include teaching and learning online, user-friendly design, learner-friendly design, and behaviourist and constructivist-oriented design. There was one sub-theme according to teaching and learning online, two sub-themes according to user-friendly design, three sub-themes according to learner-friendly design, and seven sub-themes according to behaviourist and constructivist-oriented designs. Each of these will be described in detail, further on in this section.

For each sub-theme the individual question, or groups of questions were analysed using four types of SPSS statistical analysis. SPSS was used to calculate the Mean according to participants' occupation. This was followed by an ANOVA test for two or more groups to see whether statistically significant differences existed between groups according to four of the

independent variables (occupation, age, institution, familiarity with teaching and learning online, and computer literacy). If a significant variance of opinion was found, a post hoc test was used to determine where the significant relationships occurred. A final independent T-Test analysis was used to determine whether a statistically significant difference occurred between the groups according to gender. The following sections of the chapter will review the research objectives relating to this chapter, provide more information about the tools and techniques used, and detail participants' backgrounds before providing the analysis and a discussion of the analysis. The conclusion will summarise the major findings of this chapter. The next chapter will discuss of the analysis of both the third component of the questionnaire (open-ended feedback), and the interview/email data relating to the courseware described in the previous chapter.

5.2 Quantitative Research Objectives

This chapter analyses the data in line with the first four research objectives listed in chapter three. As discussed above, the questionnaire items are split into sub-themes, and each sub-theme aligns with one of the four research objectives/overall themes. Some questionnaire items related to more than one category. If questionnaire items within each category were considered complementary (similar), then results were also analysed as clusters (see sub-themes Navigation and Real World Learning). If the questionnaire items are considered slightly different or opposing, then the results are analysed individually. Table 5.2.1 below shows the sub-theme within each theme. It also shows which questions align to which sub-theme and whether they're analysed individually or grouped together. The open-ended feedback in part three of the questionnaire may or may not align with existing categories for each of the objectives. As such, new categories were created and are discussed later in this chapter and in the next.

Table 5.2.1 Quantitative Analysis Themes, Sub-Themes and Questionnaire Items

Theme	Sub-Theme	Questionnaire Item
Teaching and Learning Online	Online vs Face -to-Face	Q.18 Online chat is an effective alternative to face-to-face learning. Q.27 Online participation increases my motivation more than face-to-face participation. Q.29 Courseware should be used in addition to face-to-face interaction.

User-Friendly Design	Navigation	Q.5 An open-ended learning environment should be present in courseware. nav_inst (Q.7 & Q.20: Q.7 Direct instructional guidance to using the courseware is essential and Q.20 Learners' should be given clear navigational directions when using the courseware).
	Screen Design and Layout	Q.21 Courseware should utilise effective usability, e.g. clear navigation and good screen design, help menu. Q.24 Attractive screen design enhances my motivation to learn. Q.25 Screen design and layout affects my ability to use the courseware.
Learner-Friendly Design	Learner Consultation	Q.1 Learners should be consulted in courseware development. Q.12 Learners should actively participate in developing course e-learning outcomes.
	Learner Styles	Q.3 Courseware should accommodate different learning styles. Q.4 Courseware should contain a range of mixed modes, e.g. text, graphics, video and sound.
	Learner Design Features	Q.2 Courseware should be based on educational philosophies or principles. Q.9 Learners should be encouraged to be independent learners in using courseware. Q.22 Courseware should be flexible to learners. Q.23 Courseware should provide useful resources for learning. Q.26 Courseware should include self-tests for learners.
Behaviourist and Constructivist-oriented Designs	Direct Instruction	Q.7 Direct instructional guidance to using the courseware is essential. Q.8 A lack of instructional guidance decreases my motivation to use the courseware.
	Open-ended	Q.5 An open-ended learning environment should be present in a courseware. Q.6 A teacher-controlled learning environment with a high level of Instructional guidance can be useful in a courseware.

	Recall and Memorisation	Q.15 Multiple-choice answers which entail a right or wrong answer are effective learning strategies. Q.16 The course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings.
	Learner Objectives	Q.10 My motivation to learn is enhanced if I know precisely what the learning outcomes are. Q.12 Learners should actively participate in developing the course learning outcomes
	Real World Learning and Higher Order Thinking	real_world_learning (Q.11, Q.13, & Q.14: Q.11 Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic. Q.13 Courseware should encourage problem-solving and embed learning in real-world examples. Q.14 Information about a specific problem should be learnt within the context of that problem).
	Multiple-choice	Q.15 Multiple-choice answers which entail a right or wrong answer are effective learning strategies. Q.28 Well-designed multiple-choice can be an effective assessment tool.
	Collaboration	Q.17 Discussion boards are an effective problem-solving tool. Q.19 Collaborating with other learners enhances learning.

5.3 Tools and Techniques

The questionnaire items were divided into sub-themes. This enabled the research to better organise the analysis of the research. It also gave a better understanding of participant feedback within each of the categories. Again, some items related to multiple sub-themes, and so were purposely repeated across the categories. For example, question five related to both user-friendly aspects of navigation and to the pedagogical aspects of open-ended learning. SPSS statistical software was used to analyse two forms of statistics in this study, descriptive and inferential. Within SPSS the analysis of the descriptive statistics is considered the first step, to summarise information about each of the variables (ITS, 2001). It enables the researcher to obtain a better understanding of each of the variables as they are, without manipulation or attempt to establish causality. This research analyses the Mean, which takes into account all responses for the individual questionnaire items, and is a

calculation of the “value each item would have if all the values were shared out equally among all the items” (Ross, 1999, Glossary section para. 1). Mathematically, it is the value of all items divided by the number of items.

Within SPSS the analysis of the variance (ANOVA) is an inferential statistic used to compare more than two independent groups on the dependent variable, which allows for several means to be compared (Leech, Barrett and Morgan, 2005). It can be used to determine whether there are differences between the dependent variables (questionnaire items), for each of the independent variables (IV). For instance, SPSS can be used to discover whether there are differences amongst the Means according to occupation for each of the questionnaire items. SPSS is also used to discover the significance of findings. That is, whether the results can be generalised across the sample population. So, if the statistical data is 0.05 or less it is considered significant, and if it is more than 0.05 it is generally considered not significant. In order to test the significance of the relationship between independent variables (non varying factors such as age) and dependent variables (varying questionnaire items), both ANOVA and a post hoc analysis was undertaken. Whilst ANOVA is used to establish significance (differences among the Means), post hoc discovers whether the Means differ. Of the post hoc options Tukey’s HSD (Honestly Significant Difference) was used. An analysis of ANOVA was used to determine significance for participants according to age, occupation, institution, familiarity with teaching and learning online or computer literacy. An independent samples T-Test was used to determine whether there were any statistically significant differences in the Mean according to gender. This analysis was used as it tests means for two groups of cases, where statistical significance is also 0.05.

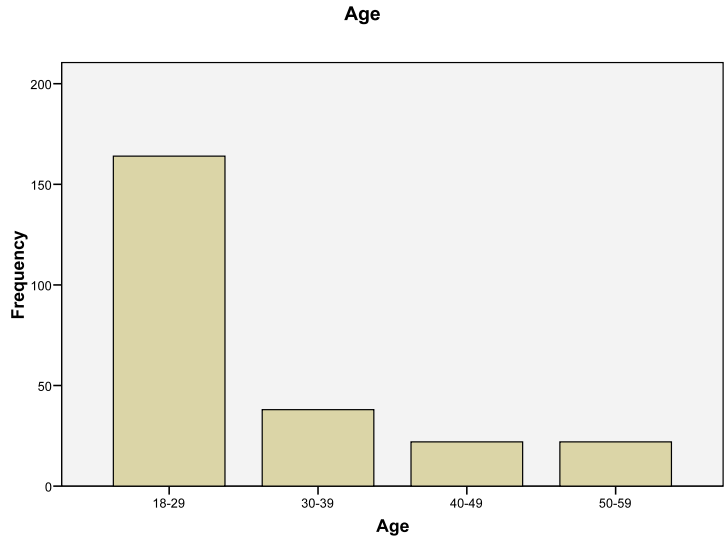
SPSS looks at the relationship between independent variables, and dependent variables. This study included six independent variables (age, occupation, institution, gender, familiarity with online learning, and computer literacy). These variables were chosen because the researcher believed that they might be used to yield some interesting results in regards to participants’ opinions on courseware design. There were 29 dependent variables, covering objectives two to five – from aspects of teaching and learning online, user-friendly and learner-friendly design, to behaviourist/constructivist-oriented designs. It is anticipated that comparing the Means of independent and dependent variables may help determine different participant groups’ views – from students, to academics to professionals in Higher Education and other institutions, towards key concepts relating to each of the four objectives. Checking statistical significance through ANOVA should also identify to what extent the results can be generalised for all levels of the independent variable. For instance, whether the results for a particular analysis be generalised across all participant types such as occupation.

The dependent variables (questionnaire items) are divided into different categories for each of the four objectives/overall themes, as represented in Table 5.2.1. The analysis is then divided into two parts. If questionnaire items are considered slightly or radically different, but are grouped within the same category, then the SPSS analysis is used to determine the Means and significance for the dependent items separately. For instance, there are two questions within the sub-theme of Learning Styles, each are slightly different. Thus, each would be analysed separately with the statistical analysis software. It is anticipated that these results will help broaden the study's understanding of different aspects of the same category. If the items are considered opposing, the results may be used to determine whether there is an issue with the validity of the results. The researcher may also utilise the qualitative data associated with the questionnaire, to analyse other ways in which apparently conflicting data may be interpreted. This refers specifically to the questions relating to the Open-ended sub-theme. Lastly, if the questionnaire items are considered considerably similar, then they will be analysed separately as well as clustered together. This refers specifically to the sub themes of Navigation (nav_inst) and Real World Learning (real_world_learning). This will also help determine the significance and validity of the results.

5.4 The Sample

The text below provides an in-depth analysis of each of the independent variables making up the sample population. There were 246 participants in this study, as show in Figure 5.1. The figure indicates that the dominant group were 18-29 year olds (66.7%), followed by 30-39 year olds (15.4%), and an equal number of 40-49 and 50-59 year olds (8.9%). There were no over 60s involved in this study, although it was anticipated that there would be a small number of students in this age bracket. Figure 5.4.1 is shown below:

Figure 5.4.1: Participants' Age

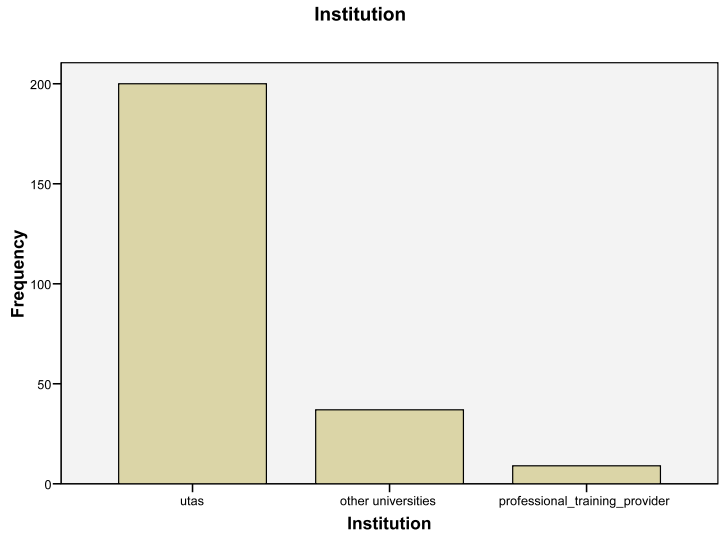


In order to better understand learners' voices in regards to courseware, the researcher considered it important for the majority of participants to be learners themselves. Of the 246 participants the majority were students (79.7%). Of these students there was similar proportions of students studying Education (41.9%) to students from Other Disciplines (37.8%). To align to the research objectives of comparing learners' voices with those of experts in Higher Education, the next largest group included academics (14.7%). Of these, there were twice as many academics from Education (9.8%) as there were academics from Other Disciplines (4.9%). Finally, the minority group included professionals (5.7%). Although the study focuses on courseware design in Higher Education, it is assumed that many professional courseware designers and developers interact with and are influenced – as well as being influenced, by teaching and learning in Higher Education. Of these professionals, 4.1% were instructional designers, and 1.6% included web developers. This is shown below, in Figure 5.4.2:

Figure 5.4.2 Participants' Occupation

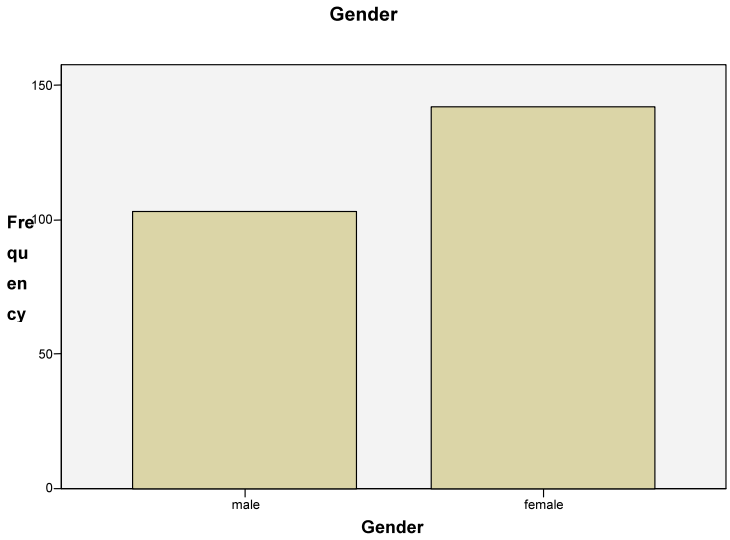
Given the convenience of access, the majority of participants came from the University of Tasmania (81.3%). This was followed by other universities (15%). Of these, most came from the University of Melbourne (14.2%), although there were individual participants from RMIT (0.4%) and Monash University (0.4%). The smallest number of replies came from professional training providers (3.7%). This is shown below, in Figure 5.4.3:

Figure 5.4.3 Participants' Institution



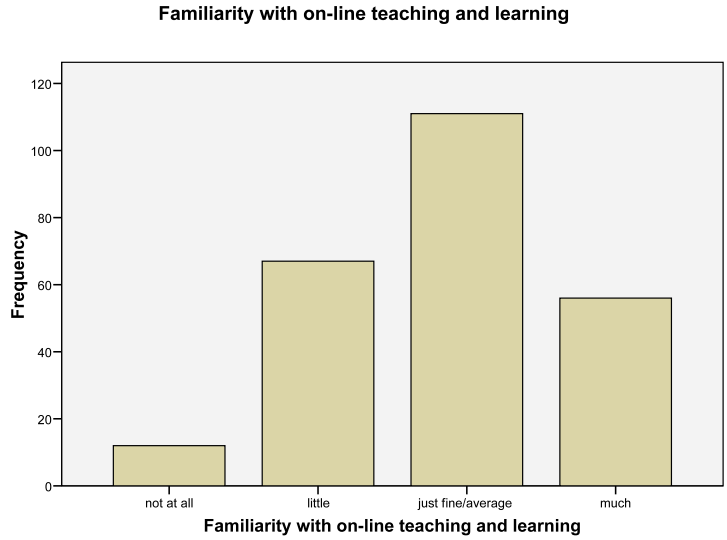
Of the 246 participants, 245 listed their gender, and there were more females (57.7%) than males (41.9%) participating. This is shown below, in Figure 4:

Figure 5.4.4 Participants' Gender



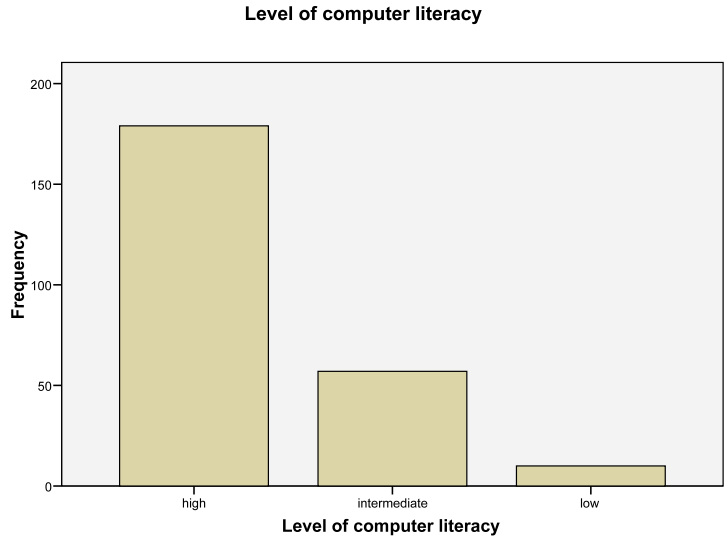
The majority of participants considered themselves to have just fine/average familiarity with on-line teaching and learning (45.1%), followed by little perceived familiarity (27.2%), and very much familiarity (22.8%). Only a minority of participants considered themselves to have no familiarity with on-line teaching and learning (4.9%). This is shown below, in Figure 5.4.5

Figure 5.4.5 Participants' Familiarity with Teaching and Learning Online



The majority of participants considered themselves to have high levels of computer literacy (72.8%), however a high number of people still rated themselves as having intermediate computer literacy (23.2%), whilst a minority thought themselves to have low levels of computer literacy (4.1%). This is shown below, in Figure 5.4.6:

Figure 5.4.6 Participants Level of Computer Literacy



5.5 Data Analysis

The purpose of this chapter is to analyse the quantitative questionnaire data. This section contains the statistical analysis, as discussed in the sections above. As mentioned above, the independent variables include participants' age, occupation, institution, gender, familiarity with teaching and leaning online, and computer literacy. The dependent variables are divided into four themes, each aligning to four of the research objectives. They include the Analysis of Perspectives of Teaching and Learning, Analysis of User-friendly Design, Analysis of Learner-friendly Design, and Analysis of Behaviourist and Constructivist-Oriented Design.

The dependent variables in the Analysis of Perspectives of Teaching are divided into one sub-theme: Online versus Face-to-Face instruction. The dependent variables in the Analysis of User-friendly Design are divided into two sub-themes: Navigation; and, Usability and Screen Design. The dependent variables in the Analysis of Learner-friendly Design are divided into three sub-themes: Learner Consultation; Learner Styles; and, Learner Design Features. The Analysis of Behaviourist and Constructivist Design is divided into eight categories: Learner Participation; Direct Instruction; Open-ended; Recall and Memorisation; Learner Objectives; Real World Learning and Higher Order Thinking; Multiple-choice; and, Collaboration. These sub-themes and their relating questionnaire items (dependent variables) are also displayed earlier in this chapter, in Table 5.2.1.

5.5.1 Analysis of Perspectives of Teaching and Learning

The questionnaire was based on Likert's Measurement of Attitudes (1932), from 1 (STRONGLY AGREE), 2 (AGREE), 3 (NOT SURE), 4 (DISAGREE), and 5 (STRONGY DISAGREE). There was one sub-theme – Online versus Face-to-Face interaction, and three different questions relating to teaching and learning online (Q.18, Q.27, and Q.29). The following analysis discusses the Mean score according to participants' occupation. It then investigates whether a statistically significant variation of opinion occurs between each of the independent variables with more than two groups (occupation, age, institution, familiarity with teaching and learning online, computer literacy). If a statistically significant variation of opinion is found, Tukey's post hoc test will be performed to establish where the significant relationships have occurred. Finally, an independent T-Test analysis will be performed, for independent variables with two groups (gender). A discussion of the findings follows within the next section.

5.5.1.1 Online Versus Face-to-Face Learning

Table 5.5.1.1a: Q.18 Means of question 'Online chat is an effective alternative to face-to-face learning'

	Q.18 Online chat is an effective alternative to face-to-face learning
Occupation	Means
academic_fe	3.13
academic_od	3.50
unistudent_fe	2.89
unistudent_od	2.88
professional_id	3.70
professional_wd	3.50
Total	2.98

The overall Mean score for participants is 2.98, which shows that generally participants are closer to being not sure, in regards to whether online chat is an effective alternative to face-to-face learning. There is a noticeable variation of opinions within the groups by occupation. Students from Other Disciplines (2.88) and Education (2.89) have the lowest Mean scores, and generally agree that online chat is an effective alternative to face-to-face participation. Academics and professionals generally are not sure whether online chat is an effective alternative to face-to-face participation. Professional instructional designers have the highest Mean score (3.70), and there is noticeable difference of opinion between this group and that of students. The analysis of ANOVA for whether online chat is an effective alternative for face to-face learning shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the means according to gender.

Table 5.5.1.1b: Means of Q.27 'Online participation increases my motivation more than face-to-face'

	Q.27 Online participation increases my motivation more than face-to-face participation
Occupation	Means
academic_educ	3.48
academc_otherdisc	3.73
student_educ	3.04
student_otherdisc	3.22
professiona_id	3.80
professional_wd	3.75
Total	3.22

The overall Mean score for participants is 3.22, which shows that generally participants are not sure, in regards to whether online participation increases their motivation more face-to-face learning. Whilst all the above groups have a Mean score located between not sure and disagree, there is still a noticeable difference of opinion amongst participants. Students from Education (3.04) have the lowest Mean score, followed by students from Other Disciplines (3.22), and academics from Education (3.48). The other occupational groups have higher Mean scores, professional instructional designers (3.80) have the highest Mean score, and there is a noticeable difference of opinion between this group and that of students from Education. The analysis of ANOVA for whether online participation increases motivation more than face-to-face participation shows that there is significant difference between participants according to age. The table representing significant difference according to age is shown in Table 5.5.1.1c below:

Table 5.5.1.1c: ANOVA for Q.27 by Age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	17.224	3	5.741	.003
Within Groups	286.677	237	1.210	
Total	303.900	240		

In order to discover which groups show a statistically significant difference, a post hoc test using Tukey's HSD is used. The following result indicates a statistically significant difference between two age groups:

- Participants aged 18-29 and 40-49 (0.03)

Participants from the youngest age group 18-29 (3.04) are significantly keener than those aged 40-49 (3.95), in regards to whether online participation increases their motivation more than face-to-face participation. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.1.1d: Means of Q.29 'Courseware should be used in addition to face-to-face interaction'

	Q.29 Courseware should be used in addition to face-to-face interaction
Occupation	Means
academic_educ	1.87
academc_otherdisc	2.42
student_educ	2.10
student_otherdisc	1.98
professiona_id	2.40
professional_wd	2.50
Total	2.07

The overall Mean score for participants is 2.07, which shows that generally participants agree that courseware should be used in addition to face-to-face interaction. There is a noticeable variation of opinions within the groups by occupation. Academics from Education (1.87) have the lowest Mean score of all groups, and strongly agree that courseware should be used in addition to face-to-face interaction. Students' low Mean scores indicate they are somewhat keener than academics from Other Disciplines and professionals in regards to whether courseware should be used in addition to face-to-face interaction. Professional web developers have the highest Mean score, and there is a noticeable difference of opinion between this group and academics from Education. The analysis of ANOVA for whether courseware should be used in addition to face-to-face interaction shows that there are no statistically significant differences between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample

analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.2 Analysis of User-Friendly Design

The questionnaire was based on Likert's Measurement of Attitudes (1932), from 1 (STRONGLY AGREE), 2 (AGREE), 3 (NOT SURE), 4 (DISAGREE), and 5 (STRONGY DISAGREE). There were two categories– Navigation, and Usability and Screen Design. There were three questions relating to Navigation one slightly different (Q.5) and two that were similar (Q.7 and Q.20). These questions were grouped together under the name 'nav_inst'. There were three different questions relating to Usability and Screen Design (Q.21, Q.24, and Q.25). The following analysis discusses the Mean score according to participants' occupation. It then investigates whether a statistically significant variation of opinion occurs between each of the independent variables with more than two groups (occupation, age, institution, familiarity with teaching and learning online, computer literacy). If a statistically significant variation of opinion is found, Tukey's post hoc test will be performed to establish where the significant relationships have occurred. Finally, an independent T-Test analysis will be performed, for independent variables with two groups (gender). A discussion of the findings follows within the next section.

5.5.2.1 Navigation

Table 5.5.2.1a: Means of Q.5 'An open-ended learning environment should be present in courseware'

	Q.5 An open-ended learning environment should be present in a courseware
Occupation	Means
academic_educ	1.87
academc_otherdisc	2.36
student_educ	2.11
student_otherdisc	2.30
professiona_id	3.00
professional_wd	2.75
Total	2.22

The overall Mean score for participants is 2.22, which shows that generally participants agree that an open-ended learning environment should be present in a courseware. There is a significant variation of opinions within the groups by occupation. Academics from Education (1.87) have the lowest Mean score, and strongly agree that an open-ended learning environment should be present in courseware. The Mean score of most of the other occupational groups is located between agree and not sure, and students from Education (2.11) were slightly keener than other groups here. Professional Instructional Designers had

the highest Mean score, and were the only group who weren't sure whether an open-ended learning environment should be present in courseware.

The analysis of ANOVA on whether an open-ended learning environment should be present in courseware did show there is significant different amongst groups according to occupation and institution. The ANOVA Tables 5.5.2.1b and 5.5.2.1c shows the variance according to occupation, and then institution.

5.5.2.1b: ANOVA for Q.5 by occupation

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	12.153	5	2.431	.017
Within Groups	203.288	237	.858	
Total	215.440	242		

5.5.2.1c: ANOVA for Q.5 by institution

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	7.790	2	3.895	.012
Within Groups	207.650	240	.865	
Total	215.440	242		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group. TUKEY HSD was chosen for this assignment. The results show that for Q.5, the following pairs show a significant relationship:

- Academics from Education/professional instructional designers (0.018)
- Professional instructional designers/students from Education (0.046)
- Participants from UTAS/professional training providers (0.021)

Academics and students from Education are significantly keener than professional instructional designers; and participants from UTAS (2.15) are also significantly keener than those from professional training providers (3.00), in regards to whether an open-ended learning environment should be present in courseware. As a majority of UTAS participants are from Education, and the majority of professionals were instructional designers, then this significant relationship is perhaps a reflection of the statistical analysis by occupation, for this question. An Independent Samples T-Test is required to assess whether there is significant difference, for independent variables with two or less sub-groups — in this case gender. The analysis found there is a statistically significant difference between males and females, of 0.000 where significance is calculated at 0.05. Females (2.18) are significantly more confident with an open-ended learning environment than males (2.27).

Table 5.5.2.1d: Means for Q.7, Q.20 and nav_inst (Q.7 and Q.20)

	Q. 7 Direct instructional guidance to using the courseware is essential	Q.20 Learners should be given clear navigational directions when using the courseware	nav_inst
Occupation	Means	Means	Means
academic_educ	2.13	1.52	1.8261
academc_otherdisc	2.17	1.50	1.8333
student_educ	2.30	1.97	2.1386
student_otherdisc	2.18	1.94	2.0652
professiona_id	2.80	1.50	2.1500
professional_wd	2.50	1.75	2.1250
Total	2.26	1.87	2.0661

The overall Mean score for nav_inst (Q.7 and Q.20) is 2.061, which shows that generally participants agree that learners' should be given clear and direct guidance to using the courseware's navigation. There is little difference in the overall Mean scores by occupation for nav_inst, which indicates that overall participants are in agreement. The overall Mean score for Q.7 (2.26) is slightly higher than that for Q20 (1.97). Generally, participants believe that providing learners with 'clear navigational directions' is more important than providing 'direct instructional guidance' within courseware. This occurrence may occur because Q.7 is worded as 'direct instructional guidance' and might have been interpreted as either instructional or navigational assistance, whereas Q.20 refers specifically to 'clear navigation'. There is notable variation of opinion within the groups by occupation for Q.7, where both academics from Education and Other Disciplines are much keener than professional instructional designers on the use of direct instructional guidance within courseware. There is also a slight variation of opinion within the groups by occupation for Q.20, where clear navigational directions in courseware are more important to academics and professional instructional designers, than students. An analysis of ANOVA shows that there is significant difference of opinion between the groups according to age, for both for Q.20 and overall for nav_inst. The ANOVA Table 5.5.2.1e shows the variance:

Table 5.5.2.1e: ANOVA for Q.20

		Sum of Squares	df	Mean Square	statistical significance
Q.20 Learners should be given clear navigational directions when using the courseware	Between Groups	15.351	3	5.117	.000
	Within Groups	184.435	239	.772	
	Total	199.786	242		
nav_inst	Between Groups	9.056	3	3.019	.002
	Within Groups	138.387	238	.581	
	Total	147.442	241		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group. TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for Q.20 according to age:

- Participants aged 18-29/ Participants aged 30-39 (0.028)
- Participants aged 18-29/ Participants aged 40-49 (0.009)
- Participants aged 18-29/ Participants aged 50-59 (0.035).

Clear navigational directions in using courseware are significantly more important to older participants aged 30-39 (1.59), 40-49 (1.41), and 50-59 (1.51), than those aged 18-29 (2.04).

The following pairs show a significant relationship for nav_inst:

- Participants' aged 18-29/Participants aged 30-39 (0.06).

Participants aged 30-39 (1.7432) consider clear and direct guidance to using the courseware's navigation significantly more important than those from the youngest age group 18-29 (2.2019). An Independent Samples T-Test is required to assess whether there is significant difference, for independent variables with two or less sub-groups – in this case gender. The analysis found there is a statistically significant difference between males and females for Q.7 of 0.015 where significance is calculated at 0.05. The inclusion of clear and direct guidance to using the courseware's navigation is significantly more important to females (2.17) than to males (2.39).

5.5.2.2 Usability and Screen Design

Table 5.5.2.2a: Q.21 'Courseware should utilise effective usability, e.g. clear navigation, and good screen design, help menu'

	Q.21 Courseware should utilise effective usability, e.g. clear navigation and good screen design, help menu
Occupation	Means
academic_educ	1.30
academc_otherdisc	1.17
student_educ	1.76
student_otherdisc	1.66
professiona_id	1.30
professional_wd	2.00
Total	1.63

The overall Mean score for participants is 1.63, which shows that generally participants strongly agree that courseware should utilise effective usability (e.g. clear navigation and good screen design, help menu). There is noticeable variation of opinion within the groups by occupation. The inclusion of effective usability in courseware is most important to academics from Other Disciplines (1.17) whom are the occupational group with the lowest Mean score. Effective usability is equally important to academics from Education and professional instructional designers (1.30), whom also have low Mean scores. Students from Other Disciplines (1.66) and Education (1.76) have slightly higher Mean scores than the previous groups, although they still strongly agree that effective usability is important in courseware. Web developers (2.0) are the only group with a Mean score located at agree as opposed to strongly agree. The inclusion of effective usability in courseware is notably less important to this group, than other groups by occupation. The analysis of ANOVA for usability shows there is significant different amongst groups according to age, institution, familiarity with teaching and learning online, and computer literacy. The ANOVA Tables 5.5.2.2b, 5.5.2.2c, 5.5.2.2d, and 5.5.2.2e shows the variance according to age, institution, familiarity with teaching and learning online, and computer literacy.

Table 5.5.2.2b ANOVA for Q.21 by age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	10.289	3	3.430	.003
Within Groups	168.114	239	.703	
Total	178.403	242		

Table 5.5.2.2c ANOVA for Q.21 by institution

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	7.193	2	3.596	.007
Within Groups	171.210	240	.713	
Total	178.403	242		

Table 5.5.2.2d ANOVA for Q.21 by familiarity with teaching and learning online

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	8.954	3	2.985	.006
Within Groups	169.450	239	.709	
Total	178.403	242		

Tale 5.5.2.2e ANOVA for Q.21 by computer literacy

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	6.267	2	3.133	.014
Within Groups	172.136	240	.717	
Total	178.403	242		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship:

- Participants aged 18-29/Participants aged 30-39 (0.029)
- Participants aged 18-29/Participants aged 50-59 (0.042)
- Participants from UTAS/Participants from professional training providers (0.038)
- Participants with little familiarity with online teaching and learning/Participants with much familiarity (0.012)
- Participants with average familiarity with online teaching and learning/Participants with much familiarity (0.007)
- Participants with high levels of computer literacy/Participants with intermediate levels of computer literacy (0.026)

Effective usability within courseware is significantly more important to participants aged 30-39 (1.35) and 50-59 (1.27) compared to those from the youngest age group 18-29 (1.78); participants from professional training providers (1.00) compared to participants from UTAS (1.71); participants with the most familiarity with teaching and learning online (1.29) compared to those with little (1.76) and average (1.74) familiarity with teaching and learning online; and participants with high levels of computer literacy (1.54) compared to those with average (1.88) computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.2.2f: Q.24 'Attractive screen design enhances my motivation to learn'

	Q.24 Attractive screen design enhances my motivation to learn.
Occupation	Means
academic_educ	2.00
academc_otherdisc	1.58
student_educ	2.09
student_otherdisc	2.30
professiona_id	1.90
professional_wd	2.25
Total	2.13

The overall Mean score for participants is (2.13), which shows that generally participants agree that attractive screen design enhances their motivation to learn. There is noticeable variation of opinion within the groups by occupation. Academics from Other Disciplines have the lowest Mean score (1.58). Along with professional instructional designers (1.90) they strongly agree that attractive screen design enhances learning motivation. Whilst the other occupational groups consider attractive screen design important to learning motivation, their Mean score is higher. Students from Other Disciplines (2.30) have the highest Mean score, and there is noticeable difference of opinion between this group and that of academics from Other Disciplines. From the analysis of ANOVA, there is statistically significant difference amongst participants according to their level of computer literacy. The ANOVA Table 5.5.2.2g shows the variance:

Table 5.5.2.2g: ANOVA of Q.24

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	7.011	2	3.506	.038
Within Groups	249.984	237	1.055	
Total	256.996	239		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for Q.24:

- Participants with high levels of computer literacy/Participants with intermediate levels of computer literacy (0.029).

Participants with the highest levels of computer literacy (2.03) believe that attractive screen design is significantly more important in terms of learning motivation compared to those with average levels of computer literacy (2.44). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.2.2h: 'Screen design and layout affect my ability to use the courseware'

	Q.25 Screen design and layout affects my ability to use the courseware
Occupation	Means
academic_educ	1.83
academc_otherdisc	1.50
student_educ	2.07
student_otherdisc	1.97
professiona_id	1.70
professional_wd	2.00
Total	1.96

The overall Mean score for participants is 1.96, which indicates that overall participants are located between strongly agree and agree in regards to whether screen design and layout affects their ability to use the courseware. There is slight variation of opinion between the groups by occupation. Academics from Other Disciplines (1.50) have the lowest Mean score, and strongly agree that screen design and layout affects usability. Professional instructional designers (1.70) and academics from Education (1.83) also strongly agree. The Mean score of students from Other Disciplines (1.97) is located between strongly agree and agree. Professional Web Developers (2.00) and students from Education (2.07) have higher Mean scores, which indicates that screen design and layout affects these groups less. The analysis of ANOVA for whether screen design and layout affects their ability to use the courseware shows that there is no statistically significant difference between the groups by age, occupation, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.3 Analysis of Learner-Friendly Design

The questionnaire was based on Likert's Measurement of Attitudes (1932), from 1 (STRONGLY AGREE), 2 (AGREE), 3 (NOT SURE), 4 (DISAGREE), and 5 (STRONGY DISAGREE). There were three categories– Learner Consultation, Learner Styles, and Learner Design Features. There were two questions relating to Learner Participation (Q.1 and Q.12), and both questions are slightly different. There were two questions relating to Learning Styles (Q.3 and Q.4), and both questions are slightly different. Lastly, there are five questions relating to Learner Design Features (Q.2, Q.9, Q.22, Q.23, and Q.26), all of which are noticeably different. The following analysis discusses the Mean score according to participants' occupation. It then investigates whether a statistically significant variation of opinion occurs between each of the independent variables with more than two groups (occupation, age, institution, familiarity with teaching and learning online, computer literacy). If a statistically significant variation of opinion is found, Tukey's post hoc test will be

performed to establish where the significant relationships have occurred. Finally, an independent T-Test analysis will be performed, for independent variables with two groups (gender). A discussion of the findings follows within the next section.

5.5.3.1 Learner Consultation

Table 5.5.3.1a: Means for Q.1 'Learners' should be consulted in courseware development'

	Q.1 Learners should be consulted in courseware development
Occupation	Means
academic_educ	2.04
academc_otherdisc	2.33
student_educ	1.97
student_otherdisc	2.19
professiona_id	2.10
professional_wd	2.25
Total	2.09

The overall Mean score for participants is 2.09, which shows that overall participants agree that learners should be consulted in courseware development. A comparison of the Mean scores by occupation indicates that there appears to be agreement between the groups. Students from Education (1.97) have the lowest Mean score, and learner consultation is most important to this group when it comes to developing courseware. Academics from Other Disciplines have the highest Mean score, and learner consultation in developing courseware is slightly less important to this group compared to other occupation groups. An analysis of ANOVA showed a statistically significant difference existed for participants according to age. This is shown in Table 5.5.3.1b below:

Table 5.5.3.1b: ANOVA for Q.1

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	8.951	3	2.984	.023
Within Groups	223.081	242	.922	
Total	232.033	245		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pair shows a significant relationship for whether learners should be consulted in courseware development:

- Participants' aged 18-29/Participants aged 30-39 (0.011).

Learner consultation in developing courseware is significantly more important to participants' aged 30-39 (1.66) than those aged 18-29 (2.20). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.3.1c: Q.12 'Learners should actively participate in developing course learning outcomes'

	Q.12 Learners should actively participate in developing course learning outcomes
Occupation	Means
academic_educ	2.48
academc_otherdisc	2.83
student_educ	2.35
student_otherdisc	2.49
professiona_id	3.00
professional_wd	2.50
Total	2.47

The overall Mean score for participants is 2.47, which shows that generally participants agree that learners' should actively participate in developing course learning outcomes. There is a noticeable difference of opinion between the groups by occupation. Students from Education (2.35) have the lowest Mean score, and active participation in co-constructing learning outcomes is most important to this group. Academics from Education, students from Other Disciplines (2.49), and professional web developers (2.50) have similar Mean scores and agree that courseware should accommodate different learning styles. Academics from Other Disciplines (2.83) also agree, however they have a slightly higher Mean score. Professional instructional designers (3.0) have the highest Mean score, and are the only occupational group whom are not sure whether learners should actively participate in developing the course learning outcomes. There is a noticeable difference of opinion between this group and that of students from Education (2.35). The analysis of ANOVA for whether learners should actively participate in developing course learning outcomes shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.3.2 Learning Styles

Table 5.5.3.2a: Q.3 'Courseware should accommodate different learning styles'

	Q. 3 Courseware should accommodate different learning styles
Occupation	Means
academic_educ	1.35
academc_otherdisc	1.58
student_educ	1.71
student_otherdisc	1.85
professiona_id	1.60
professional_wd	2.00
Total	1.72

The overall Mean score for participants is 1.72, which shows that participants strongly agree that courseware should accommodate different learning styles. There is notable difference of opinion within the groups by occupation. Academics from Education have the lowest Mean score (1.35), and the design of courseware to accommodate different learning styles is most important to this group. Academics from Other Disciplines (1.58) and professional instructional designers (1.60) have similar Mean scores that are slightly higher. The accommodation of different learning styles within courseware is more important to students from Education (1.71) compared to students from Other Disciplines (1.85). Web developers (2.0) are the only group with a Mean score located above strongly agree, and the accommodation of learning styles within courseware is much less important to this group compared to other occupational groups. There is a noticeable difference of opinion between this group and that of academics from Education. An analysis of ANOVA shows that there is a statistically significant difference according to both participants' age and level of computer literacy. The ANOVA Tables 5.5.3.2b and 5.5.3.2c shows the variance according to age, and computer literacy.

Table 5.5.3.2b: ANOVA for Q.3 by age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	13.380	3	4.460	.001
Within Groups	193.669	240	.807	
Total	207.049	243		

Table 5 5.5.3.2c: ANOVA for Q.3 by computer literacy

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	5.777	2	2.888	.033
Within Groups	201.272	241	.835	
Total	207.049	243		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for whether courseware should accommodate different learning styles:

- Participants aged 18-29/Participants aged 30-39 (0.015)
- Participants aged 18-29/Participants aged 40-49 (0.016)
- Participants with intermediate computer literacy/Participants with high computer literacy (0.030).

The accommodation of different learning styles within courseware is significantly more important to participants aged 30-39 (1.39) and 40-49 (1.27) compared to participants from the youngest age group 18-29 (1.88); and those with the highest level of computer literacy (1.63) compared to participants with the lowest level of computer literacy (1.90). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.3.2d: Means for Q.4 'Courseware should contain a range of mixed modes e.g. text, graphics, videos and sound'

	Q. 4 Courseware should contain a range of mixed modes, e.g. text, graphics, videos and sound
Occupation	Means
academic_educ	1.43
academc_otherdisc	1.50
student_educ	1.68
student_otherdisc	1.90
professiona_id	2.00
professional_wd	2.00
Total	1.75

The overall Mean score for participants is 1.75, which shows that participants strongly agree that courseware should contain a range of mixed modes, such as text, graphics, video and sound. There is only a slight variation of opinion between the groups by occupation. Academics from Education (1.43) have the lowest Mean score, and the inclusion of mixed modes of media within courseware is the most important to this group compared to other occupational groups. The other occupational groups from Higher Education all have a Mean score indicating that they strongly agree that the inclusion of mixed modes of media within courseware is essential. Both professional groups (2.0) have a Mean score located above strongly agree, and the accommodation of learning styles within courseware is much less important to these groups compared to those from Higher Education. An analysis of ANOVA shows that there is a statistically significant difference in the Means according to both age

and levels of computer literacy. The ANOVA Tables 5.5.3.2e and 5.5.3.2f shows the difference, according to age, and computer literacy:

Table 5.5.3.2e: ANOVA for Q.4 by age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	8.970	3	2.990	.024
Within Groups	222.153	238	.933	
Total	231.124	241		

Table 5.5.3.2f: ANOVA for Q.4 by computer literacy

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	7.160	2	3.580	.023
Within Groups	223.964	239	.937	
Total	231.124	241		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pair shows a significant relationship for whether courseware should contain a range of mixed modes:

- Participants aged 18-29/Participants aged 30-39 (0.021)
- Participants with intermediate levels of computer literacy/Participants with high levels of computer literacy (0.024).

The inclusion of mixed modes of media within courseware is significantly more important to participants aged 30-39 (1.35) compared to those from the youngest age group 18-29 (1.86); and to participants with the highest levels of computer literacy (1.65) compared to those with average levels of computer literacy (2.04). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.3.3 Learning Design Features

Table 5.5.3.3a: Q.2 'Courseware should be based on educational principles and philosophies'

	Q.2 Courseware should be based on educational philosophies and principles
Occupation	Means
academic_educ	1.96
academc_otherdisc	1.83
student_educ	2.20
student_otherdisc	2.41
professiona_id	1.80
professional_wd	2.50
Total	2.22

The overall Mean score for participants is 2.33, which shows that generally participants agree that courseware should be based on educational philosophies and principles. There is a noticeable variation of opinion within the groups by occupation. Professional instructional designers (1.80) have the lowest Mean score and strongly agree that courseware should be based on educational philosophies and principles. Academics have Mean scores located between agree and strongly agree. Students and professional web developers have higher Mean scores and the pedagogical design of courseware is somewhat less important to these group compared to other occupational groups. There is a slight tension between the professional groups, as web developers (2.50) have the highest Mean score. There is noticeable difference of opinion between this group and that of instructional designers. An analysis of ANOVA shows a statistically significant difference between groups according to both age and familiarity with teaching and learning online. The ANOVA Tables 5.5.3.3b and 5.5.3.3c shows the difference according to age and familiarity with teaching and learning online:

Table 5.5.3.3b: ANOVA for Q.2 by age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	24.200	3	8.067	.000
Within Groups	190.453	241	.790	
Total	214.653	244		

Table 5.5.3.3c: ANOVA for Q.2 by familiarity with teaching and learning online

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	11.103	3	3.701	.005
Within Groups	203.550	241	.845	
Total	214.653	244		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for whether courseware should be based on educational philosophies and principles:

- Participants aged 18-29/Partcicipants aged 30-39 (0.000)
- Participants aged 18-29/Partcicipants aged 49-49 (0.011)
- Participants aged 18-29/Partcicipants aged 50-59 (0.005)
- Participants with a little familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (0.040)
- Participants with an average/just fine familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (0.003).

Participants aged 30-39 (1.76), 40-49 (1.82), and 50-59 (1.77) believe that designing courseware based on educational principles is significantly more important than participants aged 18-29 (2.45); as do participants with the most familiarity with teaching and learning online (1.84) compared to those with average familiarity (2.37). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.3.3d: Q.9 'Learners should be encouraged to be independent learners in using courseware'

	Q. 9 Learners should be encouraged to be independent learners in using courseware
Occupation	Means
academic_educ	2.00
academc_otherdisc	1.92
student_educ	2.02
student_otherdisc	2.19
professiona_id	2.20
professional_wd	2.50
Total	2.09

The overall Mean score for participants is 2.09, which shows that generally participants agree that learners should be encouraged to be independent learners in using courseware. There is only a slight variation of opinion between the groups by occupation. Academics from Other Disciplines (1.92) have the lowest Mean score, and are the only group whom strongly agree that students should be encouraged to be independent learners within courseware. Academics (2.0) and students from Education (2.02) both have similar Mean scores, as do students from Other Disciplines (2.19) and professional instructional designers (2.2). These groups all agree that students should be encouraged to be independent learners within courseware. Professional web developers (2.50) have the higher Mean score, and there is noticeable difference of opinion between this group and that of academics from Other Disciplines. An analysis of ANOVA shows that there is a statistically significant different in the Mean scores according to participants level of familiarity with teaching and learning online. The ANOVA Table 5.5.3.3e shows the difference:

Table 5.5.3.3e: ANOVA for Q.9

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	6.566	3	2.189	.048
Within Groups	196.266	240	.818	
Total	202.832	243		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that for the following pair shows a significant relationship for whether learners should be encouraged to be independent learners in using courseware:

- Participants with average familiarity with teaching and learning online/Participants with the most familiarity with teaching and learning online (0.040)

Participants with the most familiarity with teaching and learning (1.82) believe that fostering independent learning within courseware is significantly more important than those with average familiarity with teaching and learning online (2.22). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.3.3f: Means for Q.22 'Courseware should be flexible to learners'

	Q.22 Courseware should be flexible to learners
Occupation	Means
academic_educ	1.78
academc_otherdisc	2.00
student_educ	1.76
student_otherdisc	1.76
professiona_id	2.00
professional_wd	1.75
Total	1.79

The overall Mean score for participants is 1.79, which shows that generally participants agree that courseware should be flexible to learners. Their similar Mean scores indicate that there is agreement amongst participants according to their different occupations. Professional web developers (1.75), academics from Education (1.78), and students (1.76) have lower Mean scores, and strongly agree courseware should be flexible to learners. Academics from Other Disciplines and professional instructional designers have higher Mean scores, and flexibility in courseware is slightly less important to these groups. The analysis of ANOVA for whether courseware should be flexible to learners shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the means according to gender.

Table 5.5.3.3g: Q.23 'Courseware should provide useful resources for learning'

	Q. 23 Courseware should provide useful resources for learning
Occupation	Means
academic_educ	1.45
academc_otherdisc	1.58
student_educ	1.71
student_otherdisc	1.68
professiona_id	1.60
professional_wd	1.75
Total	1.66

The overall Mean score for participants is 1.66, which shows that generally participants strongly agree that courseware should provide useful resources for learning. There is agreement amongst groups according to their occupation. Academics from Education have the lowest Mean score (1.45), whereas professional web developers have the highest Mean score (1.75). An analysis of ANOVA shows that there is a statistically significant difference in Means according to both familiarity with teaching and learning online and computer literacy. The ANOVA Tables 5.5.3.3h and 5.5.3.3i shows the difference according to familiarity with teaching and learning online and computer literacy:

Table 5.5.3.3h: ANOVA for Q.23 by familiarity with teaching and learning online

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	5.933	3	1.978	.052
Within Groups	179.843	237	.759	
Total	185.776	240		

Table 5.5.3.3i: ANOVA for Q.23 by computer literacy

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	5.872	2	2.936	.022
Within Groups	179.904	238	.756	
Total	185.776	240		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for whether courseware should provide useful resources for learning:

- Participants with just fine/average familiarity with teaching learning/Participants with much familiarity with teaching and learning online (0.031).
- Participants with intermediate computer literacy/Participants with high computer literacy (0.036).

The inclusion of useful learning resources in courseware is significantly more important to participants with the most familiarity with teaching and learning online (1.39) than those with average familiarity with teaching and learning online (1.79), and to participants with high levels of computer literacy (1.57) as compared to those with average levels (1.91). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.3.3j: Means for Q.26 'Courseware should include self-tests for learners'

	Q. 26 Courseware should include self-tests for learners
Occupation	Means
academic_educ	2.09
academc_otherdisc	2.25
student_educ	2.18
student_otherdisc	1.95
professiona_id	1.90
professional_wd	2.50
Total	2.08

The overall Mean score for participants is 2.08, which indicates that generally participants agree that courseware should include self-tests for learners. There is a noticeable variation of opinion within the groups by occupation. Professional instructional designers (1.90) and students from Other Disciplines (1.95) are the occupational groups most supportive of the inclusion of self-tests within courseware. Academics from Education (2.09) have a slightly lower Mean score than students from Education (2.18) and academics from Other Disciplines (2.25), but all agree that courseware should include self-tests for learners. Professional web developers (2.50) have the highest overall Mean score, and there is noticeable difference of opinion between this group and that of professional instructional designers. The analysis of ANOVA for whether courseware should include self-tests for learners shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.4 Analysis of Behaviourist and Constructivist Designs

The questionnaire was based on Likert's Measurement of Attitudes (1932), from 1 (STRONGLY AGREE), 2 (AGREE), 3 (NOT SURE), 4 (DISAGREE), and 5 (STRONGY DISAGREE). There were seven categories – Direct Instruction, Open-ended, Recall and Memorisation, Learner Objectives, Real World Thinking and Higher Order Thinking, Multiple-choice and Collaboration. There were two questions each for Direct Instruction (Q.7 & Q.8),

Open-ended design (Q.5 & Q.6), Recall and Memorisation (Q.15 & Q.16), Learner Objectives (Q.10 & Q.12), Multiple-choice (Q.15 & Q.28), and Collaboration (Q.17 and Q.19), and each were considered different. There were three questions grouped under the name real_world_learning (Q.11, Q.13 and Q.14), as each was considered similar. The following analysis discusses the Mean score according to participants' occupation. It then investigates whether a statistically significant variation of opinion occurs between each of the independent variables with more than two groups (occupation, age, institution, familiarity with teaching and learning online, computer literacy). If a statistically significant variation of opinion is found, Tukey's post hoc test will be performed to establish where the significant relationships have occurred. Finally, an independent T-Test analysis will be performed, for independent variables with two groups (gender). A discussion of the findings follows within the next section.

5.5.4.1 Direct Instruction

Q. 7 Direct instructional guidance to using the courseware is essential

The analysis of this question has been displayed earlier within the Navigation sub-theme. The overall Mean score for participants was 2.26, which showed that generally participants agree that direct instructional guidance to using the courseware is essential. There was notable variation of opinion within the groups by occupation. Academics from Education (2.13) had the lowest Mean score, and are the occupational group most supportive of the use of direct instructional guidance. Academics (2.17) and students from Other Disciplines (2.18) had similar Mean scores, as did students from Education (2.30) and professional web developers (2.50). Professional instructional designers (2.80) had the highest Mean scores, and there was notable difference of opinion between this group and that of academics from Other Disciplines. The analysis of ANOVA for whether direct instructional guidance to using the courseware is essential shows that there was no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis found there was a statistically significant difference between males and females for Q.7 of 0.015 where significance is calculated at 0.05. Direct guidance to using the courseware is significantly more important to females (2.17) than to males (2.39).

Table 5.5.4.1a: 'A lack of instructional guidance decreases my motivation to use the courseware'

	Q. 8 A lack of instructional guidance decreases my motivation to use the courseware
Occupation	Means
academic_educ	2.57
academc_otherdisc	2.09
student_educ	2.55
student_otherdisc	2.54
professiona_id	2.90
professional_wd	2.25
Total	2.54

The overall Mean score for participants is 2.54, which shows that participants generally agree that a lack of instructional guidance decreases motivation to using courseware. There is a noticeable difference of opinion amongst the groups by occupation. Academics from Other Disciplines (2.09) have the lowest Mean score, and are the occupational group who are most supportive of the belief that instructional guidance is important in maintaining learner motivation. Professional web developers (2.25) also have a lower Mean score than other groups, and believe instructional guidance is important in courseware. Academics from Education (2.57) and students have similar Mean scores, and these groups are in agreement that a lack of instructional guidance decreases motivation to using courseware. Again, professional instructional designers (2.90) have the highest Mean score, and there is a notable difference of opinion between this group and that of academics from Other Disciplines. An analysis of ANOVA found a statistically significant difference between participant groups according to their level of familiarity with teaching and learning online. The ANOVA Table 5.5.4.1b shows this below:

Table 5.54.1b: ANOVA for Q.8

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	12.076	3	4.025	.026
Within Groups	306.089	238	1.286	
Total	318.165	241		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for whether a lack of instructional guidance decreases motivation to using the courseware:

- Participants with little familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (0.025).

Participants with little familiarity with teaching and learning online (2.30) are significantly more supportive of the belief that instructional guidance is important in maintaining learner motivation within courseware, compared to participants with the most familiarity with teaching and learning online (2.89). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the means according to gender.

5.5.4.2 Open-ended

Q. 5 An open-ended learning environment should be present in a courseware

The analysis of this question has been displayed earlier within the Navigation sub-theme. The overall Mean score for participants was 2.22, which indicates that generally participants agree that an open-ended learning environment should be present in a courseware. There was a significant variation of opinions within the groups by occupation. Participants from Higher Education, particularly those from Education, were much more supportive of open-ended environments than those from professional environments. Academics from Education had the lowest Mean score (1.97), and were located between strongly agree and agree in regards to whether an open-ended learning environment should be present in courseware. Students from Education, students (2.30) and academics (2.36) from Other Disciplines all agreed that an open-ended learning environment should be present in courseware. Professional web developers (2.75) had a slightly higher Mean score than other groups however they also support open-ended environments. Professional Instructional Designers had the highest Mean score, and were the only group who weren't sure whether an open-ended learning environment should be present in courseware.

The analysis of ANOVA on whether an open-ended learning environment should be present in courseware found statistically significant differences occurred amongst groups according to occupation and institution. Since ANOVA does not specify which groups show a significant relationship, a post hoc test was necessary. The TUKEY HSD test was chosen for this assignment. The following pairs showed a statistically significant relationship:

- Academics from Education/Professional instructional designers (0.018)
- Professional instructional designers/students from Education (0.046)
- Participants from UTAS/professional training providers (0.021)

Academics and students from Education are significantly keener than professional instructional designers, in regards to whether an open-ended learning environment should be present in courseware. Participants from UTAS (2.15) are also significantly keener than those from professional training providers (3.00), in regards to whether an open-ended learning environment should be present in courseware. As a majority of UTAS participants are from Education, and the majority of professionals were instructional designers, then this significant relationship is perhaps a reflection of the statistical analysis by occupation, for this question. An Independent Samples T-Test is required to assess whether there is significant

difference, for independent variables with two or less sub-groups — in this case Gender. The analysis found there is a statistically significant difference between males and females, of 0.000 where significance is calculated at 0.05. Females (2.18) are significantly more confident with an open-ended learning environment than males (2.27).

Table 5.5.4.2a: Means for 'A teacher-controlled environment with a high level of instructional guidance can be useful in courseware'

	Q. 6 A teacher-controlled environment with a high level of instructional guidance can be useful in courseware
Occupation	Means
academic_educ	2.26
academc_otherdisc	2.33
student_educ	2.40
student_otherdisc	2.20
professiona_id	2.00
professional_wd	2.00
Total	2.28

The overall Mean score for participants is 2.28, which shows that generally participants agree that a teacher-controlled environment with a high level of instructional guidance can be useful within courseware. There is only a slight difference of opinion amongst the groups by occupation. Professionals (2.0) had the lowest Mean score, and are slightly keener on teacher-controlled environments with high levels of instructional guidance than other groups. Students from Education (2.40) had the highest Mean score, and were slightly less supportive of teacher-controlled environments with high levels of instructional guidance than other occupational groups. The analysis of ANOVA for whether a teacher-controlled environment with a high level of instructional guidance can be useful in courseware shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.4.3 Recall and Memorisation

Table 5.5.4.3a: Q.15 'Multiple-choice activities which entail a right or wrong answer are effective learning strategies'

	Q.15 Multiple-choice activities which entail a right or wrong answer are effective learning strategies
Occupation	Means
academic_educ	3.04

academc_otherdisc	3.25
student_educ	2.93
student_otherdisc	2.63
professiona_id	2.30
professional_wd	2.75
Total	2.81

The overall Mean score for participants is 2.81, which shows that generally participants agree that multiple-choice activities which entail a right or wrong answer are effective learning strategies. There is notable variation of opinion within groups by occupation. Whilst students and the professional groups agree, the academic groups are not sure whether multiple-choice questions which entail a right or wrong answer are effective learning strategies. Professional instructional designers (2.30) have the lowest Mean score, whereas academics from Other Disciplines (3.25) have the highest Mean score. The analysis of ANOVA for whether multiple-choice activities, which entail a right or wrong answer, are effective learning strategies shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.4.3b: Q.16 'The course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings'

	Q.16 The course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings
Occupation	Means
academic_educ	3.61
academc_otherdisc	3.36
student_educ	3.05
student_otherdisc	3.17
professiona_id	4.00
professional_wd	3.00
Total	3.20

The overall Mean score for participants is 3.20, which shows that generally participants are not sure whether the course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings. There is a significant difference of opinion, particularly between professional instructional designers and all other occupational groups. Professional instructional designers (4.0) have

the highest Mean score and are the only group whom disagree that the course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings. All other groups have Mean scores located between not sure and sure. Professional web developers (3.0) and students from Education (3.05) have the lowest Mean scores, and are somewhat keener than the other occupational groups. An analysis of ANOVA shows that there is a statistically significant difference between groups, according to participants' age and computer literacy. The ANOVA Tables 5.5.4.3c and 5.5.4.3d shows the significance according to age and computer literacy:

Table 5.5.4.3c: ANOVA for Q.16 by age

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	39.396	3	13.132	.000
Within Groups	265.683	238	1.116	
Total	305.079	241		

Table 5.5.4.3d: ANOVA for Q.16 by computer literacy

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	5.933	3	1.978	.052
Within Groups	179.843	237	.759	
Total	185.776	240		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that for the following pairs show a significant relationship for whether the course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings:

- Participants aged 18-29/Participants aged 30-39 (0.27)
- Participants aged 18-19/Participants aged 40-49 (.000)
- Participants aged 18-29/Participants aged 50-59 (.018)
- Participants with low levels of computer literacy/Participants with high levels of computer literacy (.025)
- Participants with intermediate levels of computer literacy/Participants with high levels of computer literacy (.031).

Participants aged 18-29 (2.94) believe it is significantly more important for the course instructor to state and enforce their opinions compared to those aged 30-39 (3.49), 40-49 (4.18), and 50-59 (3.69). Participants with the lowest (2.40) and average level of computer literacy (2.91) believe it is significantly more important for the course instructor to state and enforce their opinions compared to participants with the highest level of computer literacy

(3.34). The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.4.4 Learner Objectives

Table 5.5.4.4a: Q.10 'My motivation to learn is enhanced if I know precisely what the learning outcomes are'

	Q. 10 My motivation to learn is enhanced if I know precisely what the learning outcomes are
Occupation	Means
academic_educ	2.26
academc_otherdisc	2.25
student_educ	2.03
student_otherdisc	2.03
professiona_id	1.70
professional_wd	3.25
Total	2.07

The overall Mean score is 2.07, which shows that generally participants agree that their motivation to learn is enhanced if they know precisely what the learning outcomes are. There is a significant difference of opinion between the professional groups, and academics and students from Higher Education. Professional instructional designers (1.70) have the lowest Mean score, and are the only group whom strongly agree that their motivation to learn is enhanced if they know precisely what the learning outcomes are. Both students and academics agree on the importance of establishing learning outcomes, however students are slightly keener than academics. Professional web developers have the highest Mean score, and are the only group whom are not sure if their motivation to learn is enhanced if they know precisely what the learning outcomes are. The analysis of ANOVA for whether participants' motivation to learn is enhanced if I know precisely what the learning outcomes are that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Q. 12 Learners should actively participate in developing the course learning outcomes

This question has been analysed earlier in this chapter, within the Learner Consultation sub-theme. The overall Mean score for participants was 2.47, which shows that generally participants agreed that learners' should actively participate in developing course learning outcomes. There was a noticeable difference of opinion between the groups by occupation. Students from Education (2.35) had the lowest Mean score, and active participation in co-

constructing learning outcomes is most important to this group. Academics from Education, students from Other Disciplines (2.49), and professional web developers (2.50) had similar Mean scores and agreed that courseware should accommodate different learning styles. Academics from Other Disciplines (2.83) also agreed, however they have a slightly higher Mean score. Professional instructional designers (3.0) had the highest Mean score, and were the only occupational group whom are not sure whether learners should actively participate in developing the course learning outcomes. The analysis of ANOVA for whether learners should actively participate in developing course learning outcomes shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.4.5 Real World Learning and Problem-solving

Table 5.5.4.5a: Q.11, Q.13, Q.14, 'Real World Learning'

	Q.11 Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic	Q.13 Courseware should encourage problem-solving and embed learning in real-world examples	Q.14 Information about a specific problem should be learnt within the context of that problem	real_world_learning
Occupation	Means	Means	Means	Means
academic_educ	1.91	1.68	2.48	2.0000
academc_otherdisc	1.83	1.67	2.42	1.9722
student_educ	1.90	1.92	2.32	2.0462
student_otherdisc	1.85	1.76	2.23	1.9529
professiona_id	1.30	1.50	2.60	1.8000
professional_wd	2.00	2.00	2.50	2.1667
Total	1.86	1.81	2.32	1.9945

The overall Mean score for real_world_learning is 1.99, which shows that generally participants agree that learning should be contextualised within real-world situations that address learners' existing knowledge base. The overall Mean score for Q.11 (1.86) and Q.13 (Q.1.81) is slightly lower than for Q.14 (2.32). There is general agreement between the groups by occupation for real_world_learning. Professional Instructional Designers (1.80) and academics from Other Disciplines (1.97) believe real_world_learning is slightly more important than other groups. There is however a noticeable difference of opinion individually for Q.11, particularly between the professional groups. Professional instructional designers

(1.30) have a much lower Mean than other occupational groups, and strongly support the belief that using teaching examples that fosters prior knowledge of a subject enhances learner understandings. Professional web developers (2.0) have the highest Mean score, and are the only group with a score between agree and not sure.

There is only a slight difference of opinion between the groups for Q.13. Again professional instructional designers (1.50) have a lower Mean than other groups, and strongly agree that courseware should encourage problem-solving and embed learning in real-world examples. Professional web developers (2.0) also had the highest Mean score for this question, and again, were the only group with a score between agree and not sure. There was agreement amongst the groups for Q.14, whom all agree that information about a specific problem should be learnt within the context of that problem. Although the Mean scores were quite similar students were slightly more supportive of this question than other groups. An analysis of ANOVA shows that there is a statistically significant difference across groups according to age for Q.11, Q.13, Q.14, and overall for real_world_learning, according to institution for Q.11 only, and according to participants' familiarity with teaching and learning online for Q.11, Q.14, and overall for real_world_learning. The ANOVA Tables 5.5.4.5b, 5.5.4.5c, and 5.5.4.5d show this according to age, institution, and familiarity with teaching and learning online.

Table 5.5.4.5b: ANOVA for Q.11, Q.13, Q.14 and real_world_learning according to age

		Sum of Squares	df	Mean Square	statistical significance
Q.11 Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic	Between Groups	6.501	3	2.167	.040
	Within Groups	183.437	238	.771	
	Total	189.938	241		
Q.13 Courseware should encourage problem-solving and embed learning in real-world examples	Between Groups	7.974	3	2.658	.015
	Within Groups	177.282	238	.745	
	Total	185.256	241		
Q.14 Information about a specific problem should be learnt within the context of that problem	Between Groups	13.385	3	4.462	.002
	Within Groups	203.216	239	.850	
	Total	216.601	242		
real_world_learning	Between Groups	7.214	3	2.405	.003

	Within Groups	116.778	237	.493	
	Total	123.993	240		

Table 5.5.4.5c: ANOVA for Q.11 according to institution

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	7.089	2	3.544	.011
Within Groups	182.849	239	.765	
Total	189.938	241		

Table 5.5.4.5d: ANOVA for Q.11, Q.13, and real_world_learning according to familiarity with teaching and learning online

		Sum of Squares	df	Mean Square	statistical significance
Q.11 Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic	Between Groups	8.792	3	2.931	.010
	Within Groups	181.146	238	.761	
	Total	189.938	241		
Q.13 Courseware should encourage problem-solving and embed learning in real-world examples	Between Groups	6.485	3	2.162	.037
	Within Groups	178.771	238	.751	
	Total	185.256	241		
real_world_learning	Between Groups	5.496	3	1.832	.013
	Within Groups	118.496	237	.500	
	Total	123.993	240		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that the following pairs show a significant relationship for Q.11:

- Participants aged 18-29/Participants aged 30-39 (0.034)
- Participants from UTAS/Participants from professional training providers (0.019)
- Participants with little familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (0.006)

Participants aged 30-39 (1.51) are significantly keener than those aged 18-29 (1.95); participants from professional training providers (1.11) are significantly keener than those from UTAS (1.92); and participants with the highest level of familiarity with teaching and learning (1.54) are significantly keener than those with little familiarity (2.06) when it comes to using teaching examples that fosters prior understanding.

The results show that the following pairs show a significant relationship for Q.13:

- Participants aged 18-29/Participants aged 30-39 (0.041)
- Participants with average familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (.023)

Participants aged 30-39 (1.51) are significantly keener than those aged 18-29 (1.93); and participants with the highest level of familiarity with teaching and learning (1.52) are significantly keener than those with average familiarity with teaching and learning online (1.93) in regards to whether courseware should encourage problem-solving and embed learning in real-world examples.

The results show that for the following pairs show a significant relationship for Q.14:

- Participants aged 18-29/Participants aged 30-39 (0.012)
- Participants aged 30-39/Participants aged 50-59 (0.001)

Participants aged 30-39 (1.84) are significantly keener than participants aged 18-29 (2.36) and 50-59 (2.77) in regards to whether information about a specific problem should be learnt within the context of that problem.

The results show that for the following pairs show a significant relationship overall for real_world_learning:

- Participants aged 18-29/Participants aged 30-39 (0.002)
- Participants with little familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (0.039)
- Participants with average familiarity with teaching and learning online/Participants with much familiarity with teaching and learning online (.011).

Participants aged 30-39 (1.62) are significantly keener than participants from the youngest age group 18-29 (2.08); and participants with the most familiarity with teaching and learning online (1.72) are significantly keener than participants with little familiarity (2.07) and average familiarity (2.08) overall for real_world_learning. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

5.5.4.6 Multiple-choice

Q. 15 Multiple-choice answers which entail a wrong or right answer are effective learning strategies

This question has been analysed earlier within this chapter within the component of recall and memorisation. The overall Mean score for participants was 2.81, which indicated that generally participants agreed that multiple-choice activities which entail a right or wrong answer are effective learning strategies. There was notable variation of opinion within groups by occupation. Whilst students and the professional groups agreed that multiple-choice questions that entail a right or wrong answer are effective learning strategies, the academic

groups weren't sure. Professional instructional designers (2.30) had the lowest Mean score, whereas academics from Other Disciplines (3.25) had the highest Mean score. The analysis of ANOVA for whether multiple-choice activities, which entail a right or wrong answer, are effective learning strategies shows that there was no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.4.6a: Means for Q.28 'Well-designed multiple-choice can be an effective assessment tool'

	Q. 28 Well-designed multiple-choice can be an effective assessment tool
Occupation	Means
academic_educ	2.43
academc_otherdisc	2.83
student_educ	2.43
student_otherdisc	2.25
professiona_id	1.90
professional_wd	3.00
Total	2.37

The overall Mean score for participants is 2.36, which indicates that generally participants agree that well-designed multiple-choice questions can be an effective assessment tool. There is a significant different of opinion between the professional groups, compared to academics and students. Professional instructional designers (1.9) are the most supportive of this question, and are the only occupational group with a Mean score located between strongly agree and agree. Academics and students all have Mean scores located between agree and not sure. Students from Other Disciplines (2.25) are slightly more supportive of this question compared to academics from Other Disciplines (2.83). Both academics (2.43) and students from Education (2.43) are equally supportive of this question. Professional web developers have the highest Mean score, and are the only occupational group whom are not sure whether well-designed multiple-choice questions can be an effective assessment tool. The analysis of ANOVA for whether well-designed multiple-choice is an effective assessment tool that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. An Independent Samples T-Test is required to assess whether there is significant difference, for independent variables with two or less sub-groups. In this case Gender. The analysis showed there is a statistically significant difference between males and females, of 0.038 where significance is calculated at 0.05. Females (2.34) are significantly more supportive than males (2.40) in

regards to whether well-designed multiple-choice can be used as an effective assessment tool.

5.5.4.7 Collaboration

Table 5.5.4.7a: Q.17 'Discussion boards are an effective problem-solving tool'

	Q.17 Discussion boards are an effective problem-solving tool
Occupation	Means
academic_educ	2.57
academc_otherdisc	2.42
student_educ	2.68
student_otherdisc	2.60
professiona_id	2.70
professional_wd	2.75
Total	2.63

The overall Mean score for participants is 2.63, which indicates that generally participants agree that discussion boards are an effective problem-solving tool. There is little difference in the Mean scores by occupation. The analysis shows that academics are slightly more supportive of the use of discussion boards as a problem-solving tool, compared to students. Also, professionals were slightly less supportive of the use of discussion boards as a problem-solving took, compared to other occupational groups. The analysis of ANOVA for whether discussion boards can be used as an effective problem-solving tool shows that there is no statistically significant difference between groups by age, occupation, institution, familiarity with teaching and learning online or computer literacy. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Means according to gender.

Table 5.5.4.7b: Q.19 'Collaborating with other learners enhances learning'

	Q.19 Collaborating with other learners enhances learning
Occupation	Means
academic_educ	1.57
academc_otherdisc	1.50
student_educ	1.88
student_otherdisc	1.96
professiona_id	1.70
professional_wd	2.25
Total	1.86

The overall Mean score for participants is 1.86, which shows that generally participants strongly agree that collaboration with other students enhances learning. There is a noticeable

variation of opinion within the groups by occupation. Academics have the lowest Mean scores and are the occupational groups who are the most supportive of collaborative learning. Professional instructional designers (1.70) and students from Education both have Mean scores located between strongly agree and agree. Students from Other Disciplines (1.96) have higher Mean scores and are slightly keen on collaborative learning than the previous groups. Professional web developers (2.25) have the highest Mean score, and there is notable variation of opinion between this group and that of ac academics from Higher Education. The analysis of ANOVA shows there is a statistically significant different between groups according to their familiarity with online teaching and learning. The ANOVA Table 5.5.4.7c shows this below:

Table 5.5.4.7c: ANOVA for Q.19

	Sum of Squares	df	Mean Square	statistical significance
Between Groups	9.105	3	3.035	.020
Within Groups	216.099	237	.912	
Total	225.203	240		

ANOVA does not specify the groups, so a post hoc test is necessary in order to identify the group(s). TUKEY HSD was chosen for this assignment. The results show that there is a significant relationship for whether collaborating with other students enhance learning for the following pair:

- Participants with little familiarity with online teaching and learning/Participants with much familiarity with teaching and learning online (0.014)

Participants with the most familiarity with teaching and learning online (1.63) are significantly more supportive than those with little familiarity with teaching and learning online (2.15), in their belief that collaborating with other students enhances learning. The Independent T-Test Sample analysis shows that there is no statistically significant difference in the Mans according to gender.

5.6 Discussion of Findings

The quantitative analysis of the questionnaire data has been presented in the section above, according to four themes: teaching and learning online, user-friendly design, learner-friendly design, and behaviourist and constructivist-oriented designs. This section will provide a summary and interpretation of the result, according to the researcher. If no interpretation comes forward however, the researcher may suggest further investigation of the data. On a final note, it is important to reiterate that the purpose of this chapter is to address the first four objectives listed in Chapter One through a statistical analysis of the data. Thus, the four sub-sections below briefly addresses some of the questions relating to the objectives, that this chapter tackles, before providing an in-depth discussion of the data presented above.

5.6.1 Teaching and Learning Online

This section address two of the research questions that stem from the first objective, these are:

(b) What are some of the requirements and concerns on teaching and learning online?

(c) Does a participants' background significantly affect their perspectives on teaching and learning online?

Overall, the analysis of the quantitative data shows that participants required courseware to be used in addition to face-to-face interaction. It also found that students are supportive of online chat as an alternative to face-to-face learning. On the other hand, academics from Other Disciplines and professionals appear highly unsure about whether online participation increases motivation more than face-to-face interaction. The quantitative data showed that participants' occupation noticeably, but not significantly affects their perception of online versus face-to-face learning. On the other hand, age plays a statistically significant role in whether participants believe online motivation increases their motivation more than face-to-face participation. Further discussion of the results follows in the sub-section below.

5.6.1.1 Online versus Face-to-Face Learning

Participants support the belief that teaching and learning online should include both an online courseware component, and a face-to-face component. Academics from Education and students were noticeably more supportive of blended learning (both online and face-to-face delivery) than academics from Other Disciplines and professionals. Academics from Education may value blended learning, because their interest lies in Education so they prioritise student learning, and believe a fully-online environment may be a somewhat inadequate platform for effectively addressing students' needs. Students may place a slightly higher value on blended learning, because university is traditionally associated as a place for students to expand their social networks, and communicate face-to-face with their peers within both a learning and social environment.

Participants are not sure whether online participation increases their motivation more than face-to-face participation. Nevertheless, they are not convinced that face-to-face participation can increase learner motivation more than online participation. This tends to imply that there is a level of support and acceptance for courseware within Higher Education. There was a noticeable difference of opinion between students and professional instructional designers. Although they were not sure whether online participation is more motivating than face-to-face participation, students had a more positive reaction than professionals, whom were close to disagreeing that online participation may be more motivating than face-to-face.

This may be because students are more open to new technologies and modes of learning, and have less experience of poorly designed courseware. On the other hand, instructional designers may have more experience with poorly designed courseware: they may not be sure how to effectively design for learner engagement; or they may be limited in terms of their ability to prioritise student learning in their design, and as a result developed a somewhat negative reaction to online participation. There was a statistical significance according to age, where participants from the youngest age group 18-29 were more supportive of courseware's ability to increase their motivation more than face-to-face learning, as compared to older participants aged 40-49. Again, this might be because younger people tend to be more familiar with, and open to new technologies and modes of learning.

Participants also are not sure whether online chat is an effective alternative to face-to-face learning. Nevertheless, they remain unconvinced that online chat is a poor alternative to face-to-face learning, and this tends to imply a level of openness to new modes of communication. This finding could occur because these participants are somewhat familiar with using synchronous communication for personal/social chat sessions however they may have limited experience with using synchronous technology within a teaching and learning environment. Or, the question may have been interpreted to assume that online chat would replace face-to-face learning if it is considered effective. Since participants agree that courseware should be used in addition to face-to-face learning, this may account for their indecisiveness here. Further investigation within the qualitative data will help further our understanding of participants' opinions on online chat. More research is required to establish whether online chat is necessarily an appropriate alternative to face-to-face learning however, or merely an effective addition to a blended learning environment.

It should be pointed out that there is a discrepancy in the opinions of participants, particularly between students and instructional designers. Students are the only occupational groups whom support the belief that online chat can be an effective alternative to face-to-face learning. This may be because they are more familiar with using synchronous chat technologies, such as MSN Messenger or Skype, for personal/social chat sessions. In general, academics are not sure whether online chat is an effective alternative to face-to-face learning. This may be because they are somewhat unfamiliar with using synchronous technology within a teaching and learning environment, and are unsure whether the benefits outweigh the potential weaknesses such as 'pedagogical effectiveness' and 'time effectiveness'. Academics from Education are slightly more positive than academics from Other Disciplines in regards to the effectiveness of online chat. This may be because they are more familiar with the research on collaborative learning and its potential strengths in terms of learning.

Professional instructional designers are less positive about the effectiveness of online chat as an alternative to face-to-face learning, and interestingly are the occupational group least supportive of online learning compared to face-to-face learning. The researcher is unsure why this finding has occurred, however she guesses that two issues may come into play here. Firstly, the nature of professional training tends to be focused on actively applying theory to practice, whereas learning within Higher Education tends to be more conceptual and focused on theoretical principles. So, instructional designers may believe that an online interaction cannot be as effective as face-to-face interaction due to the kinaesthetic nature of the learning tasks required.

Secondly, instructional designers may be less experienced with using collaborative technologies since professional training providers tend to be slower on the uptake of technology-enabled collaboration. They may remain unconvinced of the pedagogical effectiveness of synchronous chat due to the somewhat limited literature regarding the use of synchronous chat within commercially oriented learning environments. Further investigation within the following qualitative chapter will help uncover some instructional designers' opinions on online communication. Further research is still required however, in order to discover whether the finding that instructional designers are less positive about online communication compared to face-to-face learning is consistent within other professional training environments, and why this may be the case.

5.6.2 User-Friendly Design

This section address three of the research questions that stem from the second objective, these are:

(a) How important is screen design and layout, navigation design, and usability design for effective teaching and learning online?

(b) What are some of the requirements and concerns on user-friendly courseware design?

(c) Does a participants' background significantly affect their perspectives on user-friendly courseware design?

In short, well-designed screen design and layout, navigational design, and usability are essential for effective teaching and learning online. Overall, participants require well-designed screen design and layout, effective usability design (e.g. navigation, screen design, help menu), and attractive aesthetics. These features were particularly important to academics from Other Disciplines, compared to web developers. When it came to navigational design there were mixed opinions according to occupation, in regards to whether to support and open-ended environment. Generally however, participants agree that clear and direct navigational design is important for effective teaching and learning online.

The quantitative data showed that: occupation, institution and gender plays a significant role in deciding whether an open-ended navigational environment should be present in courseware; age plays a significant role in determining whether participants require clear and direct navigational guidance; age, institution, familiarity with teaching and learning online, and computer literacy play a significant role in deciding whether courseware should utilise effective usability; and, computer literacy plays a significant role in determining whether attractive screen design enhances participants' motivation to learn. Further discussion of the results follows in the sub-section below

5.6.2.1 Navigation

Participants agree that an open-ended learning environment should be present in courseware, however they also believe that courseware should include clear and direct navigational guidance. This indicates that whilst they support a high degree of navigational fidelity/flexibility, they also require clear navigational pathways perhaps to ensure that they does not 'get lost' within the learning environment. When it comes to an open learning environment, there are statistically significant differences of opinion according to occupation, institution, and gender. Academics and students from Education are significantly keener on open learning environments compared to professional instructional designers whom are not sure whether open learning environments are effective. The researcher is not sure why this finding has occurred, however she guesses that it may be because participants' from Education are more supportive of independent learning environments where learners' control the direction and pace of their learning. Further research is required in order to shed light on why instructional designers are unsure about open-ended learning environments.

Since the majority of participants from Education are from the University of Tasmania, it is perhaps not surprising that they are significantly keener on open learning environments compared to those from professional training providers. Finally, females are significantly more supportive of open learning environments however they are also significantly more supportive of direct instructional guidance compared to males. Thus, whilst they're more comfortable with directing their own navigation, they also believe it is important to obtain direction. When it comes to clear and direct navigational guidance there is agreement amongst groups according to occupation, however there is a statistically significant difference of opinions according to age. Participants from the youngest age group 18-29 require significantly less navigational directions compared to those from the next age group 30-39. Again, the researcher is not sure why this finding has occurred. Whilst she guesses that the younger participants aged 18-29 are somewhat more familiar with the technology and require less navigational assistance because of this, it cannot be assumed that the younger the participant the less navigational guidance required. That is because participants

aged 40 and over requires less navigational guidance than those aged 30-39. Further research is needed in order to shed some light on this issue.

5.6.2.2 Usability and Screen Design

Participants strongly believe that courseware should utilise effective usability, including features such as clear navigation (as discussed above), good screen design, and a help menu. There is also unanimous agreement that screen design and layout affects their ability to use the courseware. This indicates that well-designed usability and screen design plays an extremely important role in courseware design. When it comes to usability in general, there is a notable difference of opinion amongst the groups by occupation. Academics and professional instructional designers place much more importance on usability design than students, whereas web developers place the least importance on usability design. This may be because students and web developers tend to be more technologically literate, so they may be more intuitive and confident when it comes to exploring new interfaces. There are also statistically significant differences in the Mean according to age, institution, familiarity with teaching and learning online, and computer literacy. Effective usability in courseware is significantly less important to participants from the youngest age group 18-29, compared to those aged 30-39 and 50-59.

Again, this may be because younger participants tend to be more confident with using computer-based technologies, and more open to new technologies. Participants from professional training providers consider effective usability significantly more important than those from UTAS. This could be because they have more experience in designing and delivering courseware, and believe the effective usability is the most important aspect of a commercially successful product. When assessing a software product, it is much easier to measure the success of a product's usability than it is its learning design. Finally, participants' with high levels of familiarity with teaching and learning and computer literacy consider usability significantly more important than those with only average levels. This could be because they have much more experience with using computer software, and are more familiar with the pitfalls of poor usability design.

Participants consider attractive screen design slightly less important in courseware compared to usability design, however they do agree that attractive aesthetics enhances their motivation to learn. So, whilst effective usability remains participants' priority, attractive usability also goes a long way towards maintaining learners' attention online. There is a discrepancy in participants' opinions according to their occupation. Academics from Other Disciplines and instructional designers consider attractive aesthetics much more important to learner motivation than other groups. The researcher is unsure why this might be the case, and suggests that further investigation is required in regards to this issue. There was a

statistically significant difference according to computer literacy, where those with the highest level of computer literacy are significantly more supportive of the fact that attractive screen design enhances their motivation to learn compared to those with average levels of computer literacy. This could be because they have much more experience with using the World Wide Web and other computer software programs, and have a much stronger sense of how aesthetics can affect their virtual experience.

5.6.3 Learner-Friendly Design

These section addresses four of the research questions that stem from the third objective, these are:

(a) Should learners be consulted in designing courseware? Should courseware be designed to accommodate different learning styles?

(b) Do participants believe courseware should be based on educational philosophies? Do participants value specific features of courseware, i.e. enabling independent learning, designing for flexible learning, providing learning resources, and self-tests for learners?

(b) What are some of the requirements and concerns on learner-friendly courseware design?

(c) Does a participants' background significantly affect their perspectives on learner-friendly courseware design?

In general participants agree learners should be consulted in courseware development. They also agree learners should actively participate in developing course e-learning outcomes, although instructional designers are not convinced either way. Respondents' age significantly affects their opinion on whether learners should be consulted in courseware development. Participants strongly agree that courseware should accommodate different learning styles, and a variety of mixed – modes of media such as text, graphics, video, and sound, however their age and computer literacy significantly affects their opinion. Participants' generally agree courseware should be based on educational philosophies and principles, however their age and familiarity with teaching and learning online significantly influences their opinion. Participants' also generally agree that learners should be encouraged to be independent learners in using courseware, however their familiarity with teaching and learning online affects their opinion.

By the large respondents strongly agree courseware should be flexible to learners, and they agree that courseware should include self-tests for learners, and their background does not significantly influence their opinion in any way. Finally, respondents strongly agree courseware should provide useful resources for learning, however their familiarity with teaching and learning online, and their computer literacy significantly affects their opinion. In short, participants generally require that learners be consulted development, and that

learners actively participate in developing course e-learning outcomes. Instructional designers however are not convinced about whether learners should play a role in developing the course e-learning outcomes. Participants also require that courseware should: accommodate different learning styles; accommodate a range of mixed-media modes such as text, graphics, video and sound; be based on educational philosophies and principles; encourage independent learning; be flexible to learners; provide useful resources for learning; and include self-tests. Further discussion of the results follows in the sub-section below.

5.6.3.1 Learner Consultation

Respondents agree that learners should be consulted in courseware development. Academics and students from Education have a slightly elevated Mean score compared to other groups, perhaps because they are more familiar with the literature on learner-centered methodologies. There was a statistically significant difference in the Means according to age, where participants aged 30-39 valued learner consultations in courseware development significantly more than those aged 18-29. The researcher is unable to explain this phenomenon, and further research is required to establish a reason for this finding, and to investigate whether this finding is consistent amongst other studies. Respondents are slightly less keen in regards to whether learners should actively participate in developing course outcomes within courseware. This may be because they are still supportive and familiar with a traditional teaching methodology, where the instructor predefines the learning outcomes. There was a discrepancy in the opinions of participants however. Students from Education were more supportive than other groups when it came to contributing to the course objectives. This may be because they are familiar with the literature on learner-centered methodologies, and they are more open to putting these methodologies into practice. The opinions of instructional designers varied noticeably from other occupational group. They weren't sure whether learners should contribute to the learning outcomes. This could be because they are more supportive of a traditional view of instructional design, where the course objectives are predefined and the instruction is designed around the acquisition of knowledge on each objective.

5.6.3.2 Learning Styles

Participants strongly believe that courseware should accommodate different learning styles. This principle is supported by their equally strong support of mixed media within courseware, such as text, graphics, video and sound. There was a discrepancy in the opinions of participants however. Academics from Education are more supportive of both accommodating different learning styles and utilising mixed media within courseware. This could be because they are more familiar with the literature on different learning styles, and as academics of Education take the pedagogical design of courseware more seriously than

those from other occupational groups. Web developers are noticeably less supportive of both accommodating different learning styles and utilising mixed media without courseware. This could be because they take the pedagogical design of courseware less seriously than other occupational groups, and may be more concerned with the time and cost of implementing the design.

There was a statistically significant difference of opinion according age and computer literacy in regards to whether courseware should accommodate different learning styles. Participants aged 30-39 and 40-49 are significantly more supportive of accommodating different learning styles compared to those aged 18-29. Participants aged 30-39 is also significantly more supportive of including mixed media within courseware compared to those aged 18-29. One explanation for this could be because participants from the youngest age group are more familiar with their personal learning styles, therefore better able to address their learning requirements independently. Participants with the highest level of computer literacy are significantly more supportive of accommodating different learning styles and utilising mixed media within courseware compared to those with average levels of computer literacy. This could be because they have more experience of software that does not cater to their personal learning style.

5.6.3.3 Learning Design Features

Participants agree courseware should be based on educational philosophies and principles. Perhaps because their jobs lie in the sphere of education, instructional designers and academics believe it is more important than other occupational groups. There was a statistically significant difference by age and familiarity with teaching and learning. Participants from the youngest age group considered the educational design of courseware to be significantly less important than other age groups. The researcher guesses that this may be because they're more familiar with the technology, and more resourceful when it comes to accessing information. Perhaps it is because they have more experience in using poorly designed courseware, that participants with the most familiarity with teaching and learning online considered the educational design of courseware to be significantly more important than those with little or average familiarity. Respondents generally agree that learners should be encouraged to be independent learners in using courseware. Statistically however participants with the most familiarity with teaching and learning online consider independent learning significantly more important than those with average familiarity. This may be because they have more experience in using teacher-centered courseware, which is controlled and directed by the instructor to the extent that the lack of learner control over the interface is frustrating.

Respondents strongly support the belief that courseware should be both flexible to learners, and that it should provide useful resources for learning. There was a statistically significant difference of opinion when it comes to the inclusion of useful resources however. Participants with the most familiarity with teaching and learning online and the highest level of computer literacy consider the inclusion of useful resources significantly more important than those with only average levels. The researcher is unsure why this may be the case, and suggests further investigation may help uncover why this finding has occurred. Finally, respondents agree that courseware should include self-tests for learners. There was a noticeable difference of opinion between the occupational groups, where instructional designers considered the inclusion of self-tests much more important than web developers. Again, the researcher is unsure why this may be the case, however he suggests that web developers are less supportive of self-tests as they may prioritise the development time over the educational advantages of online simulations.

5.6.4 Behaviourist and Constructivist Designs

This section addresses the first three research questions that stem from fourth objective in detail. It also briefly touches on the fourth research question, however this question will be addressed in more detail within the Conclusion chapter. These research questions are:

(a) What are students', academics', and professionals' attitudes in regards to design features on: direct instructional guidance, open-ended environments, recall and memorisation, course objectives, real world learning, multiple-choice activities, and collaborative learning?

(b) What are some of the requirements and concerns on designs based on behaviourist and constructivist philosophies?

(c) Does a participants' background significantly affect their perspectives on designs based on behaviourist and constructivist philosophies?

(d) Could the two philosophical concepts be amalgamated within courseware design to act as 'complementary toolkits'?

Students, academics and professionals all agree that direct instructional guidance to using the courseware is essential, and that a lack of instructional guidance decreases learners' motivation in using courseware. Participants' gender significantly affects their opinion on direct instructional guidance, and their familiarity with teaching and learning online significantly affects their opinion on a lack of instructional guidance. There was a mixture of opinions on the design of open-ended learning environments. Academics from Education strongly agree an open-ended learning environment should be present in courseware. Students, academics from Other Disciplines, and web developers all agree an open-ended learning environment should be present in courseware. Instructional designers however are not sure whether an open-ended learning environment should be present in courseware. On the other hand, participants' all agree a teacher-controlled environment with a high level of

instructional guidance can be useful in courseware. These apparently contradictory findings suggest that both behaviourist and constructivist-oriented strategies on open-ended and direct instruction may be united within courseware to form complementary design toolkits. It should be pointed out that participants' occupation, institution, and gender all influence their opinion on open-ended learning environments.

When it comes to recall and memorisation professionals and students agree multiple-choice activities that entail a right or wrong answer are effective learning strategies. Academics however are not sure whether multiple-choice activities that entail a right or wrong answer are effective learning strategies. Also, web developers, students, and academics are not sure whether the course instructor should state and enforce their opinions about course content, rather than encouraging the learner to express other understandings. Professional instructional designers however disagrees that the course instructor should state and enforce their opinions about course content, rather than encouraging the learner to express other understandings. Participants' age and computer literacy both affects their opinion on whether the course instructor should reinforce their opinions within courseware through recall and memorisation strategies. There was a range of opinions when it comes to the learning outcomes. Instructional designers strongly agree that motivation to learn is enhanced if they know precisely what the learning outcomes are. Students and academics agree that motivation to learn is enhanced if they know precisely what the learning outcomes are, however web developers however are not sure.

Students, academics and web developers agree that learners should actively participate in developing course e-learning outcomes, however instructional designers are not sure. Participants' occupation significantly affects their opinion on whether their motivation to learn is enhanced if they know precisely what the learning outcomes are. When it comes to real world learning and problem-solving, instructional designers strongly agree on its importance, students and academics from Other Disciplines agree, whilst students and academics from Education and web developers all agree. Both age and familiarity with teaching and learning significantly affects respondents' opinions on the value of embedding learning within real world problems. The general support of both recall and memorisation strategies through multiple-choice questions as well as real world problem-solving, suggests once more, that behaviourist and constructivist-oriented strategies may be combined to form complementary design tool-kits. It should be pointed out however, that participants' had mixed opinions on both recall and memorisation, and open-ended learning environments, so further investigation is required to find out more about this idea.

There is also a range of opinions on the design of multiple-choice questions in courseware. Instructional designers, students, and web developers all agree multiple-choice activities that

entail a right or wrong answer are effective learning strategies, however academics are not sure. Also, instructional designers strongly support well-designed multiple-choice for assessments, whilst students and academics agree, however web developers are not sure. Participants' gender significantly affects their opinion on the value of well-designed multiple-choice questions as a form of assessment. Finally, when it comes to collaboration, academics, students, and professionals all agree discussion boards is an effective problem-solving tool, and there are no significant differences of opinion according to participants' background. Academics, students and instructional designers all strongly agree, and web developers agree that collaborating with other learners enhances learning. Participants' familiarity with teaching and learning online significantly affects their attitude on the value of collaborating with other learners.

In short, participants generally require: direct instructional guidance; open-ended learning environments; learning outcomes that are clear upfront, but in which learners have active input in co-developing; learning embedded within real world problems; multiple-choice activities; and that collaboration between learners is fostered. It should be pointed out however, that: instructional designers are not convinced about whether an open-ended learning environment should be present in courseware; academics are not convinced about whether multiple-choice activities which entail a right or wrong answer are effective learning strategies; web developers are not sure whether motivation to learn is enhanced if they know precisely what the learning outcomes are; instructional designers are not sure whether learners should participate in developing course e-learning outcomes; and, web developers are not sure whether well-designed multiple-choice can be an effective assessment tool. By and large, participants are not sure about whether the course instructor should encourage recall and memorisation, although they generally support multiple-choice questions that are aimed at lower order thinking strategies. It should be pointed out that instructional designers appear concerned about encouraging recall and memorisation through the strategy of reinforcement. Interestingly however, they are the occupational group most supportive of multiple-choice questions that encourage recall and memorisation.

5.6.4.1 Direct Instruction

Although direct instructional guidance is not necessarily an outcome of a behaviourist philosophy, direct instructional guidance is often linked to behaviourist strategies within the pedagogical-based literature and practice of instructional design. This study included two different questions relating to direct instruction. Their similar outcomes however, indicate a level of agreement on the role of direct instruction within courseware. The research findings in this chapter show that participants require courseware with direct instructional guidance, and believe a lack of direct guidance can negatively affect their motivation in using courseware. Within both questions instruction designers had a Mean score higher than other

occupational groups. This indicates that although they agree direct instruction is important, they are less keen about this feature than other occupational groups. This may be because they support a pragmatic approach to direct instruction, which includes a balance between instruction and open-endedness.

There is a difference of opinion between academics of Other Disciplines and instructional designers. Academics of Other Disciplines are noticeably more supportive of direct instructional guidance than instructional guidance. The researcher is unsure why this may be the case, and suggests that further investigation is required to establish whether this finding occurs within other studies, and to establish a rationale if a similar finding occurs. There are statistically significant differences of opinion for both questions relating to direct instruction. Females are significantly more supportive of direct instructional guidance compared to males. This may be because females are happier to accept guidance, whereas males prefer to take a more domineering role in directing themselves. Finally, participants with little familiarity with teaching and learning online believe that a lack of instructional guidance significantly decreases their motivation in using courseware compared to those with the most familiarity with teaching and learning online. This may be because participants with the lowest levels of familiarity are less confident with their online environment, and require more instructional guidance as a result. Likewise, respondents with the highest level of familiarity may be more confident with their online environment, and thus keener to control the direction of their learning independently.

5.6.4.2 Open-ended

Although open-endedness is not necessarily an outcome of a constructivist philosophy, open-endedness in courseware is often linked to constructivist-based strategies within the literature and practice of instructional design. Thus, the researcher has made the assumption, that open-endedness is a trait of both learner-centered designs – and more specifically those based on constructivism. On the other hand, teacher-controlled learning environments with a high level of instructional guidance tend to be linked to behaviourism. The findings from this research indicate that whilst participants agree direct instruction is important, they also believe that an open-ended learning environment in courseware should also be present. The results of question five showed that in general participants agree an open-ended learning environment in courseware should be present. Participants require some degree of flexibility and learner-control, in terms of being able to control the navigation and direction of their learning. There was however, a statistically significant difference of opinion amongst participants according to their occupation, institution and gender.

There is a significant difference of opinion between students and academics from Education whom supports open-endedness, compared to instructional designers whom are not sure

whether to support open-endedness in courseware. Likewise, there is also a significant difference of opinion between respondents from UTAS – whom support open-endedness, compared to respondents from professional training providers whom are less supportive of open-endedness in courseware. This may be because learner-centered practices have been implemented and supported to a greater degree by those from Higher Education, particularly by participants from Education whom are most familiar with the philosophical underpinnings and literature on open-ended learning environments. Commercial training providers tend to lag behind in learning innovation, preferring to base their approach on existing design models that have been 'tried and tested'. Furthermore, as there is still a gap in the literature on the move from teacher-centered to learner-centered practices, designers and developers may still be unconvinced that open-ended learning environments are effective. Females also have a significantly lower Mean score compared to males when it comes to open-ended learning environments. This implies they are more confident with taking control of their learning pathway, and require less guidance compared to that of males. This may be because they are more open to asking for help however, if they require navigational or instructional guidance.

Intriguingly, whilst participants generally support learner-centered open-ended learning environments, the results of question six show that participants also agree that a teacher-controlled environment with a high level of instructional guidance can be useful in courseware. This tends to indicate that in regards to learner control, a balance between direct instruction and open-endedness is required. Thus, the researcher suggests that it is necessary to redefine 'learner-centered' to incorporate a range of navigational/instructional options for learners. At the heart of this issue however, is whether this approach is philosophically possible? That is, can both constructivist and behaviourist oriented strategies be applied within the same courseware? The researcher tends to believe that whether the end product is necessarily oriented towards a behaviourist or constructivist approach depends on the way in which the design elements work as a whole. She suggests that it is possible that both behaviourist and constructivist strategies can be incorporated as complementary design features. On a final note here, it is relevant to point out that professionals had the lowest Mean score of all occupational groups for question six. This supports the finding that professionals continue to be more attached of teacher-controlled learning environments, compared to participants from Higher Education

5.6.4.3 Recall and Memorisation

Recall and memorisation are both lower order thinking skills associated with a behaviourist approach to educational design. Examples of behaviourist approaches within courseware include those that encourage the reproduction of predefined knowledge and content provided by the instructor. This is in contrast to designs associated with higher order thinking skills,

such as constructivism, which encourage the reconstruction of more sophisticated knowledge structures. A review of the literature shows that there is a growing acceptance that behaviourist models which encourage lower order thinking, are generally ineffective designs for Higher Education. Nevertheless, there continues to be some level of debate regarding behaviourist versus constructivist strategies. Furthermore, the researcher's experience of eLearning design indicates that behaviourist strategies continue to dominate contemporary instructional design practices. Interestingly, the quantitative data shows that participants are not sure whether they support a behaviourist approach to courseware design. In particular, the overall Mean score for question 18 indicates that in general participants are not sure whether the course instructor should state and enforce their opinions about course content, rather than encourage the learner to express other understandings. This tends to indicate that respondents are not completely committed to moving away from behaviourist-oriented designs. This could be because participants are still somewhat supportive of approaches that encourage recall or memorisation, and continue to believe a teacher-centric approach is effective. Further investigation within the following qualitative chapter will help explain the quantitative findings on recall and memorisation.

It should be pointed out that there is a significant difference of opinion amongst participants according to their occupation, and a statistically significant difference of opinion according to participants by age and computer literacy. Professional instructional designers are the only occupational group whom disagree that the course instructor should state and enforce their opinions, rather than encourage the learner to their own understanding. This tends to indicate that this group are the least supportive of behaviourist strategies that promote the lower order thinking skills of recall and memorisation. Interestingly, younger students (18-29) have a much lower Mean score than respondents from other age groups, are quite supportive of route memorisation. They would like to see the course instructor state and reinforce their opinions about course content, rather than encourage them to express other understandings. This may be because younger students have less sophisticated knowledge base on the course content compared to other students, and require more direct instruction, particularly when starting out. Or, it may be because in general, younger students are somewhat more interested in 'pleasing' the instructor to obtain high marks, and utilising a rote-recall approach is an easier strategic learning method. Interestingly again, participants with the lowest level of computer literacy are very supportive of the course instructor taking a behaviourist teaching approach. This may be because they are somewhat insecure with using new technology, and as such require higher levels of teacher guidance even when it comes to the educational design of courseware.

Multiple-choice activities are popularly associated with designs that utilise a behaviourist approach, because they tend to be designed in a way that forces the learner to memorise the

course instructor's opinions. The quantitative data included a question regarding multiple-choice activities as a tool for recall and memorisation. Given respondents' uncertainty regarding designs which encourage recall and memorisation - as indicated above, it is surprising to the researcher that respondents generally agree that multiple-choice activities which entail a right or wrong answer are effective learning strategies. The researcher guesses that this finding may be a reflection of learners' need for interactive forms of self-testing. She also believes that the feedback from this question alone is inadequate to surmise whether participants' support multiple-choice questions as part of a behaviourist design, or whether they believe the activity could be complementary to a more flexible design. Further investigation of the qualitative data is needed in order to examine participants' opinions regarding multiple-choice questions within courseware.

Finally, it should be pointed out that there is a noticeable difference of opinion amongst respondents according to their occupation. Professionals and students from Higher Education agree that multiple-choice activities that entail a right or wrong answer are effective learning strategies, whereas academics from Higher Education are not sure. It is surprising to the researcher that instructional designers are so supportive of multiple-choice strategies that tend to encourage recall and memorisation, given their earlier dissatisfaction with designs that encourage lower order thinking by learners. It may be that both professionals and students support multiple-choice activities as effective self-testing tools for learners, without necessarily considering how these tools may impact upon the overall educational design of courseware. Again, further investigation of the qualitative data is needed in order to examine participants' opinions regarding multiple-choice questions in courseware. In particular, are respondents wholly supportive of multiple-choice questions designed to promote recall in practice? Which aspects of multiple-choice activities do they support, and which aspects to they believe can be improved upon?

5.6.4.4 Learner Objective

The design of the learning objectives is an important part of the teaching and learning strategy. One of the biggest differences between behaviourist and constructivist methodologies is the way in which the learning objectives are designed. Traditional teacher-centered methodologies influenced by behaviourism tend to include objectives pre-designed by the instructor. The learning design then focuses on the acquisition of skills required to fill each of the pre-defined objectives in a linear fashion, one after the other. Contemporary learner-centered methodologies influenced by constructivism tend to emphasise the learner's role in co-constructing their learning objectives in order for the learning to be more meaningful and engaging. The quantitative data included two questions relating to the design of the learner objectives, in order to uncover participants' perspectives on this important component of the educational design.

Whilst participants generally support the belief that learners should actively participant in developing the course objectives, they are even more supportive of the belief that their motivation to learn is enhanced if they know precisely what the learning outcomes are. This emphasises the importance of clearly stating the learning outcomes upfront, even if the design of those outcomes (or at least the processes) are to be negotiated between student and instructor. There is a noticeable difference of opinion amongst participants when it comes to the design of the learning objectives, particularly between instructional designers compared to other occupational groups. Instructional designers are the only group whom strongly support the belief that learning motivation is improved if the objectives are clear upfront. They are also the only group whom are not sure whether learners should actively participant in developing course objectives. This is not surprising given that traditionally, the role of instructional design is rooted in behaviourism, and revolves around the pre-design of the objectives, which then dictates the rest of the learning design and assessment. It may be that instructional designers are either hesitant about or unsure how to move towards more learner-centered approaches rooted in constructivism. Further research is required in order to obtain a more-detailed perspective on instructional designers' opinions on the design of learning objectives, and how these impact upon the learning design.

Finally it should be mentioned that web developers have a significantly different opinion to both instructional designers and all other occupational groups when it comes whether learners should know precisely what the learning outcomes are. Web developers are the only group whom are not supportive of knowing precisely what the learning outcomes are. The researcher is unsure why this may be the case, and suggests that further analysis of the qualitative data may help generate an understanding of why this finding has occurred.

5.6.4.5 Real World Learning and Problem-solving

One of the main differences between behaviourism and constructivism is that behaviourists' adhere to an objectivist epistemology that considers knowledge as being single dimensional and fixed. As a result, behaviourist instructional strategies emphasise learning 'domain content' (information about a problem) in order to solve the problem. The focus is on the 'attrition' of knowledge, by routing learners linearly through a series of interfaces with pre-determined outcomes, generally ending in a multiple-choice quiz that tests recall and memorisation. In contrast constructivists believe that learning occurs as a result of 'mental construction'. That is, when students actively construct their own understandings, by comparing the new information with their existing knowledge base (what they know), and 'reconstructing' their own understandings. In this way, they view knowledge as multi-dimensional. As a result constructivist-learning methodologies use teaching examples that foster students' prior knowledge of a subject. The emphasis is on embedding learning within

a problem-based context that appropriates real-world examples, such as case studies and CLEs. Within this active learning environment domain content is covered from within the context of the real-world problem, and students tend to have more control in regards to what content they decide to access, and how they access it navigationally.

The quantitative data included three questions relating to real world learning and problem-solving. These three questions were grouped together and analysed as an object entitled real_world_learning in SPSS. Overall, participants agree that real world learning and problem-solving is important. This supports the literature that promotes constructivist-learning methodologies. The data indicated general agreement in regards to the importance of real_world_learning by occupation, although instructional designers have a slightly lower Mean score than other groups. This may be because the design of business and compliance case studies rooted in real-world examples is one of the major tasks for instructional designers working within a commercial environment.

The data for real_world_learning also indicated however, that there was a statistically significant difference according to age and familiarity with teaching and learning online. Participants aged 30-39 believes that embedding learning within real world examples is significantly more important than those aged 18-29. The researcher is not sure why such a significant difference has occurred between these groups, and suggests that further research may help assist in providing an answer. Participants with the most familiarity with teaching and learning online also believe that supporting real world learning is significantly more important, than those with little or average familiarity. This may be because they have spent more time as students within an online environment, and have found that the inclusion of real world learning situations play a strong role in learner engagement. Alternatively, they could have found that a lack of problem-based content based on real world situations meant that the content was not meaningful to them.

Analysing each of the questions comprising real_world_learning separately, shows that there is more support overall for question 11 ‘Using teaching examples that foster my prior knowledge of a subject enhances my understanding of a topic’ and question 13 ‘Courseware should encourage problem-solving and embed learning in real-world examples’, compared to question 14 ‘information about a specific problem should be learnt within the context of that problem. This may be because participants interpreted this question slightly differently to questions 11 and 13. It could be that participants also believe that domain content can also be covered outside the context of real-world environment, however it is difficult to extrapolate given the limitations of the questionnaire. It relevant to point out here, that whilst there was general agreement amongst participants according to their occupations for questions 13 and 14, there was disagreement amongst participants when it came to question 11. Instructional

designers are much more supportive of ‘using teaching examples that foster prior knowledge of a topic’, compared to other groups. Again, this may be because situated ‘case based activities’ are prevalent in many commercial courseware products, even those whose overall design is based on behaviourist instruction. There is a slight tension in the opinion of instructional designers compared to web developers, whom are the least supportive of question 11 compared to other occupational groups. The researcher guesses that this may be because web developers consider this question in terms of the time it would take to develop the teaching examples. As such they may need to be convinced of the educational value of the teaching example they are to develop, in order to validate their efforts in development time. This perspective however, is only based on the researcher’s experience within the field of instructional design. Further analysis of the qualitative data in the next chapter, may help validate this point of view.

There are statistically significant differences according for all the individual questions relating to real_world_learning. Each of the three questions shows that there is a statistically significant difference of opinion according to participants’ age. Again, it appears that those aged 30-39 years old are significantly more supportive of real world learning compared to other groups. There is also statistically significant difference of opinion according to participants’ familiarity with teaching and learning online for both questions 11 and 13. Again, those with the most familiarity with teaching and learning online are more supportive of real world learning. Finally, there is a statistically significant difference of opinion according to participants’ institution, for question 11. Respondents from professional training providers are significantly more supportive of incorporating real world learning examples compared to those from UTAS. One reason for this could be the high level of support given by professional instructional designers for all questions relating to real_world_learning. It is interesting that there is not also a statistically significant difference of opinion between to respondents from professional training providers and ‘other universities’, however this could be due to the fact that the majority of Higher Education respondents came from UTAS.

5.6.4.6 Multiple-choice

The instructional use of multiple-choice questions has briefly been discussed earlier, within the sub-theme of Recall and Memorisation. In theory, multiple-choice questions may be designed to address the type of lower order thinking generated by behaviourist strategies, or the higher order thinking which constructivist-oriented strategies attempt to generate. The former strategy tends to force a ‘right or wrong’ answer, whereas the latter strategy aims at encouraging a more open-ended response that focuses on individual problem-solving. In practice however, multiple-choice questions tend to be designed in a way that stimulates learners’ ability to recall the learning content. They are often used as the sole or partial means of online assessment, particularly within commercial training environments. There is

debate amongst academics and instructional designers however, in regards to whether multiple-choice questions are effective learning tools. In particular, the move towards constructivist learning strategies may have resulted in a feeling of negativity towards multiple-choice questions by some academics. The quantitative data in this research indicates that participants are generally supportive of multiple-choice questions. They agree that multiple-choice questions entail a 'right or wrong' answer are effective learning strategies. This may be related to their need to monitor their learning progress as suggested by participants' strong support of self-testing.

There is a noticeable difference of opinion amongst participants according to their occupation however. Professionals and students believe multiple-choice questions directed at lower order thinking is effective learning strategies, whereas academics are not sure. This could be because academics' may be more knowledgeable of the theory on teaching and learning, but are not entirely sure how that theory fits in practice. That is, they may believe that higher order thinking is essential, however they may not be sure whether multiple-choice questions directed at lower order thinking are worthwhile from a student's point of view. Whilst participants agreed that overall, multiple-choice questions that entail a right or wrong answer are effective learning strategies, they are even more supportive of using multiple-choice questions for assessment. Overall, respondents agree that multiple-choice questions may be used as an effective assessment tool, as long as they are well-designed. According to the research's respondents there is a place for multiple-choice questions within contemporary courseware, particularly for assessment. Due to limitations of the questionnaire design however, it is difficult to extrapolate on how participants' define the term 'well-defined', and the type of assessment that they refer to.

Further analysis of the qualitative data may help yield a better understanding of these two issues. The quantitative data also showed that there is a significant difference of opinion amongst participants according to their occupation, and a statistically significant difference of opinion amongst participants according to gender, in regards to using multiple-choice questions for assessment. Instructional designers strongly support the use of well-designed multiple-choice for assessment, perhaps because traditionally the design of multiple-choice for self-testing and assessment forms one of their basic functions. Whilst academics and students from Higher Education all support the use of well-designed multiple-choice for assessment, there was noticeably more support from students from Other Disciplines compared to academics from Other Disciplines. Further analysis of the qualitative data may help explain why academics from Other Disciples are less supportive. Finally, females are significantly more supportive of well-designed multiple-choice questions for assessment compare to males. The researcher is not sure why this may be, and suggests that further research may help shed light on this finding.

5.6.4.7 Collaboration

Contemporary research in Education focuses on the importance of fostering collaboration within teaching and learning environments (student-instructor, student-student). Social constructivists in particular, point out that learning is essentially a social activity, and therefore believe that collaboration must be encouraged for learning to take place. The literature and practice on courseware design shows that there are varying opinions on the use of discussion boards for learning, particularly when it comes to its effectiveness as a problem-solving tool. The quantitative data shows that in general participants strongly believe that collaborating with other learners enhances learning. This appears to support social constructivists belief that collaboration is necessary for learning to take place. On the other hand, whilst participants agree that discussion boards are an effective problem-solving tool, the overall Mean score for this question is much higher. Thus, whilst participants support collaboration for learning, they are less supportive of using discussion boards for the learning task of problem-solving. The may be a multitude of reasons for this, such as a preference for face-to-face collaboration. An analysis of the qualitative data should enlighten us on some of the participant's reasons.

There are noticeable differences of opinion according to occupation, and statistically significant differences of opinion according to familiarity with teaching and learning online, in regards to whether collaborating with other learners enhances learning. Interestingly however, there is agreement amongst participants when it comes to their opinion on the use of discussion boards for problem-solving. Academics and instructional designers are more supportive of encouraging students to collaborate compared to students themselves. The researcher guesses that this may be because students are also supportive of individual learning, and may find that collaborating with other students can introduce difficulties if they are not able to work together effectively. Web developers had a higher Mean score than all other occupational groups, and are less supportive of encouraging students to collaborate within learning environments. The researcher is unsure why this may be the case, and suggests further investigation of this issue may help yield an understanding. Participants with the most familiarity with teaching and learning online are significantly keener on encouraging students to collaborate, compared to participants with little familiarity with teaching and learning online. It could be that participants with the most experience with teaching and learning online find that collaboration plays an essential role in engaging learners, and that a wholly student-computer relationship may have a negative impact on learner motivation.

5.7 Conclusion

In summary, the purpose of the chapter has been to present the quantitative analysis of the questionnaire data. The background to the analysis was discussed, prior to presenting the

results of the analysis. SPSS statistical software was used to perform this analysis. The questionnaire data was divided into themes and sub-themes, and each sub-theme was analysed according to occupation. The occupational differences according to the Mean were presented. Following this, an analysis of ANOVA was performed on all questions/groups of questions within each sub-theme according to the independent variables (age, occupation, institution, familiarity with teaching and learning online, computer literacy). This was to find out whether statistically significant differences occurred between Means between groups of more than two sub-groups. If a statistically significant difference was found, Tukey's post hoc test was performed in order to see where the significant relationships occurred. Finally, an independent-t test analysis was undertaken in order to discover whether a statistically significant difference occurs according to participants' gender. The discussion following the analysis addressed whether the chapter fulfilled the thesis' objectives, and provided more detail to how these objectives were fulfilled. In short:

- Participants generally agree courseware should be used in addition to face-to-face learning.
- Students generally agree online chat is an effective alternative to face-to-face-learning, however academics and professionals are not sure.
- Participants generally are not sure whether online participation increases their motivation more than face-to-face participation.
- Participants generally support both open-ended navigational designs, as well as courseware with clear and direct navigational design.
- Participants agree that attractive aesthetics are important, however they strongly agree courseware should utilise effective usability, and that screen design and layout plays an important role here.
- Participants' generally agree courseware should accommodate different learning styles, and utilise a range of mixed-media modes, such as text, graphics, video and sound.
- Participants' generally strongly agree courseware should be flexible to learners, and contain provide useful resources. They agree that courseware should be based on educational philosophies and principles that independent learning should be encouraged, and that courseware should provide self-tests.
- Respondents generally agree that direct instructional guidance to using the courseware is important, and that a lack of instructional guidance can decrease learner motivation.
- There is a mixture of opinions on open-ended learning. Generally participants support an open-ended learning environment, however they also believe teacher-controlled environment can be useful. This tends to suggest that both behaviourist and constructivist-oriented designs may be combined to form complementary toolkits.

Further investigation is required however, to ensure the se results are not extrapolated out of context.

- All in all respondents are not sure whether the course instructor should encourage recall and memorisation, however they generally support multiple-choice activities which address these lower order thinking strategies.
- There is a mixture of opinions on learner objectives. Generally, participants believe learners' should know precisely what the learning outcomes are, however they also agree that learners should actively co-develop the learning outcomes.
- Respondents are very supportive of embedding learning within real world problems. Given their support of multiple-choice questions aimed at lower order thinking, it is possible that both behaviourist and constructivist-oriented designs may be combined to form complementary toolkits. It should be pointed out though, that participants were unsure about whether the course instructor should encourage recall and memorisation. Further investigation is required to find out more about participants' preferences on the learning design of courseware.
- There is a mixture of opinions on multiple-choice questions. Generally, participants agree multiple-choice questions that entail a right or wrong answer is effective learning strategies, and that well-designed multiple-choice can be an effective assessment tool.
- Finally, participants generally agree discussion boards are an effective problem-solving tool, and that collaborating with other learners enhances learning.
- Statistically significant of opinions were found according to occupation for Q. 5. Significant differences of opinion were found according to occupation for Q.5, Q.10, Q.16, and Q.28.
- Statistically significant differences of opinion were found according to age for Q.1, Q.2, Q.3, Q.4, Q.11, Q.13, Q.14, Q.16, Q.20, Q.21 and Q.27.
- Statistically significant differences of opinion were found according to institution for Q. 5 and Q.11.
- Statistically significant differences of opinion were found according to familiarity with teaching and learning online, for Q.2, Q.8, Q.9, Q.11, Q.13, Q.19, Q.21, and Q.23.
- Statistically significant differences of opinion were found according to computer literacy, for Q.3, Q.4, Q.16, Q.21, Q.23, and Q.24.
- Finally, statistically significant differences of opinion were found according to gender, for Q.5, Q.7, and Q.28.

Thus, statistically significant differences of opinion were found within the sub-themes according to: teaching and learning online (by age); user-friendly design (by occupation, age, institution, familiarity with teaching and learning online, computer literacy, and gender); learner-friendly design (by age, familiarity with teaching and learning online, and computer literacy); and, behaviourist and constructivist-oriented designs (by occupation, age,

institution, familiarity with teaching and learning online, computer literacy, and gender). The following chapter will present the qualitative component of this research. This includes an analysis of the open-ended questionnaire component, as well as the courseware interview / email data. The sub-themes presented in this chapter will form a starting point for the researcher's analysis of the qualitative data. The following chapter will give a different type of insight, drawn upon some of the opinions on the data in this chapter, as well as presenting some emerging themes and issues.

Chapter 6: Qualitative Analysis

6.1 Introduction

The previous chapter analysed the quantitative data from the questionnaire, which found notable and statistically significant differences according to occupation – which was the main focus of the analysis. It also found statistically significant differences according to age, occupation, institution, gender, familiarity with teaching and learning online, and computer literacy, within all the components of the areas listed below. This chapter will analyse the qualitative component of the questionnaire as well as the courseware evaluation, in an attempt to generate some emerging themes on areas of:

(1) Teaching and learning online
(2) User-friendly courseware design
(3) Learning design: learner-friendly courseware design
(4) Learning design: behaviourist and constructivist based designs

It is worth noting again, that as (3) focuses on the effective pedagogical features of courseware, then (4) is really a sub-component. The decision to make a distinction between the two is justified by the researcher for two reasons. Firstly, behaviourist and constructivist-oriented designs are a particular focus of this research so they need to be analysed separately. Secondly, there is a range of other pedagogical features on effective courseware design that does not fit neatly into the area of behaviourist or constructivist-oriented designs. It is also worth emphasising, that the features of behaviourist and constructivist designs that

this thesis looks at, are based primarily on the researcher's interpretation of the epistemologies, theories and designs within the existing literature.

The questionnaire includes both numerical and open-ended data. The numerical data was analysed in the previous chapter, which focused on the quantitative component of this research. The open-ended data from the questionnaire will be discussed in this chapter, as it focuses on the qualitative component of this research. This chapter is divided into two sections: the analysis of the open-ended component of the questionnaire; and, the analysis of the courseware evaluation, from the participant interviews. The themes/sub-themes in which the researcher discusses the emerging ideas were based on inductively analysing and 'pulling together' the data. As such, there are new issues not featured in the quantitative chapter. For example, the perceived 'unreliability' of the technology, as discussed within the concerns on the theme of 'teaching and learning online'. There are some issues that appear to concern participants' more than others (such as screen design and usability) which means there is more data concerning these aspects of user-friendly design than other design features, and there are some issues which could fit into multiple themes. For example the issue of 'screen design and layout' within courseware fit into both a requirement and concern of the user-friendly design analysis. It should be pointed out that there are differences within the two sections of this chapter. The open-ended answers from the questionnaire provide a space for general comments on courseware design. This provides participants with an opportunity to express in their own words, their perceived strengths and weaknesses of courseware. This helps enlighten the researcher behind potential meanings behind some of the statistical results. It also presents new ideas, which cannot be expressed through the statistical analysis alone. The courseware evaluation on the other hand, specifically refers to a prototype courseware. Open-ended interview and email data provides participants with the opportunity to evaluate a 'user-friendly' courseware based primarily on constructivist-oriented principles, in their own words. This helps contextualise the questionnaire data, and provides a more objective analysis on user-friendly and learner-friendly courseware design.

6.2 Qualitative Analysis

6.2.1 Qualitative Analysis

In quantitative research the process of research is essentially deductive, where the researcher starts with a set of pre-conceived themes, and utilises tools such as questionnaires to undertake statistical analysis, in order to test specific questions relating to these themes. Here, theories are 'deduced' from pre-existing assumptions existing in the research. Uwe Flick (2007) explains:

> *"The researcher's starting point is the theoretical knowledge taken from the literature or earlier empirical findings. From this, hypotheses are derived which are*

operationalized and tested against empirical conditions […] The aim is that the representativeness of the data and findings can be guaranteed […] A further aim is the breaking down of complex relations into distinct variables, which allows the researcher to isolate and test their effects" (p. 41).

The previous chapter illustrated the deductive process of research utilised in this thesis, and presented some specific findings relating to courseware in Higher Education. The analysis involved asking narrow questions which mapped specifically to the thesis' research questions, collecting numeric data linked to these questions from our participants (students and academics in Higher Education, as well as professional instructional designers and web developers), and conducting what Creswell (2005) calls an 'inquiry in an unbiased, objective manner" (p. 39).

In qualitative process of research is mostly inductive, where the themes of the research are not necessarily pre-conceived, but tend to emerge as the investigator utilises an open-ended research tool – e.g. semi-structured interview or open-ended email data, in order to discover the perspectives of the participant. The qualitative component of this research involved asking participants' perspectives via general open-ended questions concerning courseware design, analysing the text of the feedback to generate theories on key aspects of courseware design. This contrast to the empirical method utilised in quantitative studies, and is influenced by Grounded Theory research, which is a qualitative approach where theory is generated from observation, and grounded in 'data' (see Glaser and Strauss "The Discovery of Grounded Theory: Strategies for Qualitative Research" 1967).

According to Flick (2002) Grounded Theory involves sampling, coding, and writing the theory. The subjective nature of qualitative analysis means that the validity of the research can sometimes be questioned. The strength of the 'grounded' model is that it involves an iterative process where interpretations of data are transient. As new data is analysed, the interpretation of this data constantly evolves. When all the data has been analysed, the final 'themes' fully emerge. Thus the model enhances the flexibility, rigour, and validity of the qualitative analyses.

- Sampling: Within interviews, sampling generally involves making decisions about which people to interview, deciding which interviews should be transcribed and interpreted, and making decisions about which parts of the text should be used to illustrate the findings.
- Coding: This is where the 'core of the data interpretation occurs, and involves identifying emerging categories/themes. There is a range of steps involved, of which this research will point out the three most relevant. Firstly open coding, which involves iteratively analysing the data to look for any complementary or contradictory data, and to identify the themes. This is important, as these provide the "basic building blocks of

theory" (Strauss and Corbin 1990 p.74 as quoted in Flick 2002). Secondly axial coding, which comes next and involves further refining categories into sub categories. It involves both inductive and deductive thinking (now the main categories have emerged), and is "geared toward discovering and relating categories in terms of the paradigm model" (Strauss and Corbin 1990 p.114 as quoted in Flick 2002). Thirdly selective coding, which is about creating a central theme in which the other emergent themes may be linked.

- Writing the theory: This centres on how to present the qualitative research. Strauss and Corbin (1990) suggest presenting a 'clear analytic story', writing conceptually and keeping descriptions secondary, clearly specifying themes and sub-themes, and clearly specifying any variations in the data.

This chapter will present the qualitative component of this research, which as mentioned, is strongly influenced by the Grounded Theory methodology described above. For instance:

- Sampling: The intention of the research was to obtain feedback from six groups including academics and students in Education and Other Disciplines, as well as professional Instructional Designers and Web Developers. So the sample groups for both the open-ended questionnaire and courseware evaluation included participants representing these groups. To enhance the reliability and validity of the questionnaire, there were over two hundred and fifty participants involved. The courseware interviews however, included only ten participants representing the six groups. More information about the sample groups and the data collection process are detailed both in Chapter Three and the design component of this chapter. The researcher chose to digitally collate and transcribe all feedback. The decision about which components of the feedback to use in order to illustrate the findings was made however, after the coding occurred.
- Coding: During the coding process, the researcher read through the data to examine whether any initial major themes emerged on complementary, and potentially differing perspectives. Continual iterations involved analysing the text of the words to find further linkages, and to define sub-themes. The final iteration involved grouping the existing sub-themes into the most central themes – and linking these to the thesis' objectives. When it came to the open-ended questionnaire data, the researcher did have some pre-defined themes and sub-themes from the empirical component of the questionnaire. This provided a backdrop when it came to creating sub-categories for the qualitative data. Given the open-ended nature of the feedback, it cannot fall neatly into the pre-defined subdivisions, however it is necessary to point out that the researcher did not strictly start with a *tabula rasa*.
- Writing the theory: The results components of this chapter provide a general account of the findings across the pre-defined themes and sub-themes, followed by specific examples from the data that illustrate the emerging themes.

There is some interplay between deductive and inductive methods, within qualitative research. As Glaser and Strauss (1998) point out in their chapter about the coding (axial) process, “interpretation is a form of induction” (p.136). That is, the researcher ‘deducts’ what is happening based not only on the data, but also the pre-existing knowledge maps we have from the literature and discourse on the topic being analysed. Taking into account that we as humans may therefore distort the meaning of the analysis, the researchers emphasise the importance of the Grounded Theoretical method of validating interpretations by “constantly comparing one piece of data to another” (p.137). Although indicated above, it should be emphasised, that this interplay between the deductive and inductive process can be seen in this research. The coding mapped to some recognised themes from the previous chapter, however the sub-themes both enlighten the research on perspectives framing the quantitative results, and introduce some emerging topics. For example, the results of the questionnaire analysis clearly mapped to the pre-defined themes and sub-themes recognised from the thesis objectives, and quantitative analysis, so these were kept. The analysis here provided an insight into perspectives on these themes, which the quantitative approach does not provide. Again, some sub-themes emerged, such as the concern by academics on the ‘time-consuming’ nature of designing, delivering and facilitating courseware.

Whilst this chapter focuses specifically on the qualitative results, the researcher may make linkages at times to findings from the quantitative chapter, as well as between the open-ended questionnaire and interview, where the findings are thought to be potentially enlightening or particularly interesting. The intention however, is to investigate both the quantitative and qualitative data within the following Conclusion chapter of this thesis. As stated in the Methodology chapter, this research uses this mixed-methods approach and converges both quantitative and qualitative methodological approaches. Burns (1994) notes that the problem with quantitative research is that it “fails to take into account people’s unique ability to interpret their experiences, construct their own meanings and act on these” (p.10), whereas the weakness of the qualitative method is “the impossibility of unbiased observation of the basic events/facts” (p.9), as each observer will have different interpretations based on their past experiences, expectations and personality. Whilst the Grounded Theory will be used here in an attempt to enhance the research’ validity, triangulating the data will further enhance its vigour and scope. The mixed-methods approach allows the researcher to exploit the strengths of both methodologies, and compensate for their potential limitations. As Brewer and Hunter (2006) note “This multimethod strategy is simple but powerful. For if our various methods have weaknesses, then our convergent findings can be accepted with far greater confidence than any single method’s finding would warrant” (p.4).

The previous chapter presented a statistical analysis of perspectives on pre-defined areas of courseware design. The focus was specifically on differences according to occupation, however significant differences were also noted according to age, institution, gender, familiarity with teaching and learning, and computer literacy. A key concern here however, which the previous chapter does not address, is what are participants' experience with courseware in Higher Education? What do they perceive the strengths and weaknesses of existing courseware to be? This chapter attempts to deal with this concern, and in doing so fill a gap in the literature by presenting the range of voices that would otherwise be 'silenced'. Having discussed the theory, the following section will show how these features translate on a more practical level to the design of this research. For instance, it will present the open-ended questions asked by participants, more information about the participants, and the central themes that emerged within the findings for the open-ended questionnaire, and then the courseware evaluation.

6.2.2 Design

6.2.2.1 Open-ended Questionnaire

6.2.2.1.1 Questions, Messages, Participants

As mentioned above, the first part of the qualitative research involved the questionnaire. Whilst Parts A and B included the quantitative component, Part C included the qualitative component (see Chapter 3 or Appendix). Here, participants' were asked two open-ended questions: firstly (Q1), "What feature(s) of courseware would you like to see?" and secondly (Q2), "What feature(s) of courseware do you dislike the most?" The messages generally ranged from lists with around three bullet points, to longer answers in sentence structure around 100 words in length. Many of the messages included spelling and grammatical errors. The questionnaire was paper-based it was difficult to translate the text of some messages. Also, some messages were so short, it was difficult or impossible to understand what viewpoint the participant was trying to portray. Overall however, most messages were easy to translate despite the translation difficulties and spelling/grammatical errors. They were analysed as a whole, and several emerging themes immediately arose whilst others grew out of the Coding process.

There were 246 participants whom responded to the quantitative component of the questionnaire (Parts A and B). Of these, there were a total of 264 messages for the two questions in Part C – 137 participants responded to Q1, and 127 participants responded to Q2. Table 6.1 below shows the total number of participant messages across the six different occupational types, for Q1 and Q2, as well as the total number of participants whom had undertaken the questionnaire. The purpose of showing this figure is two-fold. Firstly, whilst the qualitative chapter intends to focus on emerging themes from the participants as a whole,

significant feedback from specific occupational types may be pointed out throughout the chapter. Secondly, the researcher considered it important to point out that of the occupational groups, all academics from Other Disciplines (A_OD) and professional instructional designers (ID) responded both Q1 and Q2. It appears is clear that these groups have more to say about the features of courseware than other groups.

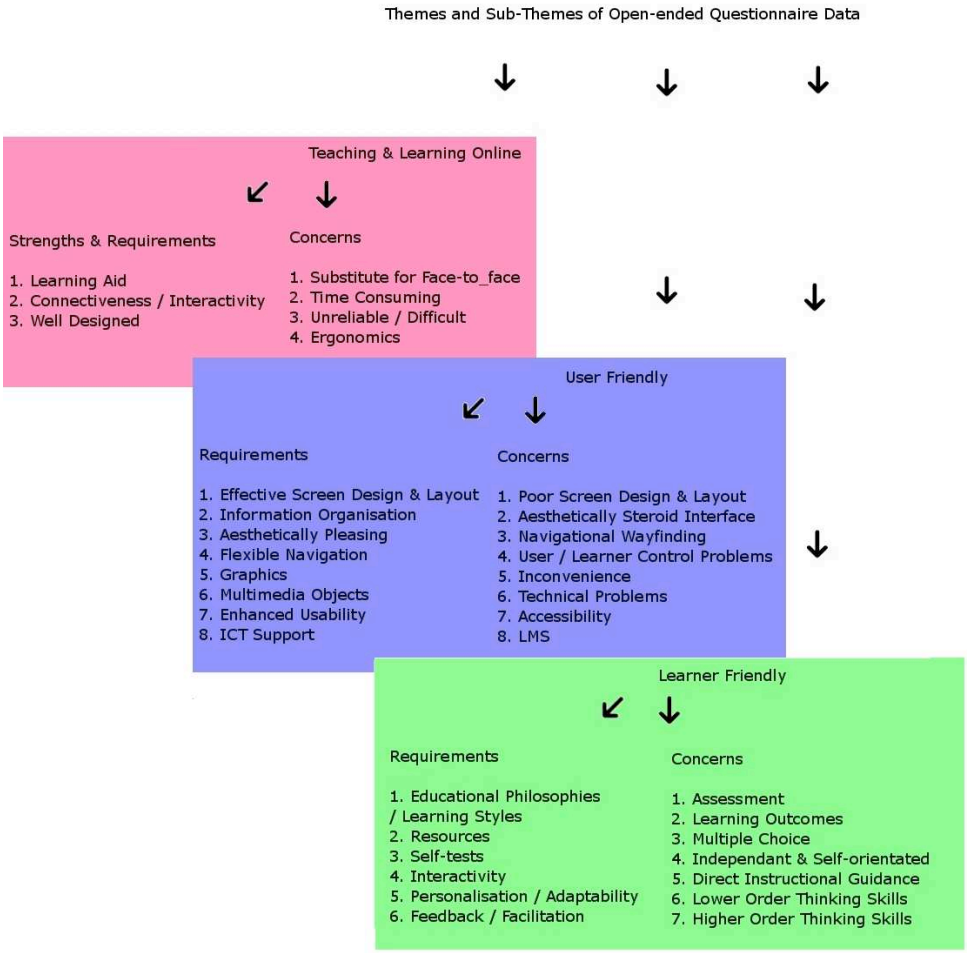
Table 6.2.2(a) Number of participant messages across occupational types, and total number of participants

Occupation of participants (Number of open-ended responses/number of participants)							
Number of Replies for Q1 and Q2 / Original number of Participants		Academic Education (A_E)	Academic Other Disciplines (A_OD)	Student Education (S_E)	Student Other Disciplines (S_OD)	Professional Instructional Designer (ID)	Professional Web Developer (WD)
	Q1: What feature(s) of courseware would you like to see?	12 /24	12/12	38/103	63/93	10/10	2/4
	Q2: What feature(s) of courseware do you dislike the most?	13/24	12/12	36/103	53/93	10/10	3/4

6.2.3.1.2 Emerging Themes

As mentioned above, when analysing the messages for both Q1 and Q2 several emerging themes immediately arose whilst others grew out of the coding process. In the final iteration six 'nuclear' themes emerged from the analysis of the questionnaire. Whilst these appear to map neatly to the thesis' areas of research, it is important to point out here that that the sub-themes provide both an in-depth insight into perspectives on a number of issues covered within this research, as well as introducing some new sub-themes which contribute to our understanding of the perceived strengths and weaknesses of contemporary courseware. In other words the qualitative component of the research provides an in-depth picture into the views and attitudes on specific areas of courseware design, some of which have been touched upon already, and others that have emerged as new categories. Figure 6.1 shows the emerging themes, directly below. These will be discussed in detail, further on in the Results component of this chapter.

Figure 6.2.2(a) Themes and sub-themes of open-ended component (part c) of questionnaire data



6.2.2.2 Courseware Evaluation

6.2.2.2.1 Questions, Participants

Whilst the first part of the research data collection and analysis involved the questionnaire, the second part included the courseware evaluation. Participants of the courseware evaluation were specifically chosen to represent a variety of backgrounds, as detailed below. The intention in choosing a wide demographic was to see whether there were any further emerging themes according to identified or non-identified background types. For example, several interview participants were non-native speakers of English. It was also assumed, that the diversity of participants would present different ways of seeing a number of issues. This enhances the validity of the research during the coding process, when applying our Grounded Theory methodology.

Two major types of participants were invited to evaluate the courseware. The first type included the existing participants. That is, when the questionnaires were distributed, participants were also invited to take part in a face-to-face interview on the design of a prototype courseware (see Chapter Three and Appendix). Ten participants were selected to take part in this interview, and their details are discussed further on in this section. The

second type of participants stemmed from an international background. They accessed the courseware and provided feedback fully-online. The intention in broadening the scope of participant to this group was to gain new insights into the user-friendly and learner-friendly aspects of the courseware design, to consolidate recognised themes, and see if any emerge. The research also utilised three different online educational listservs to invite potential participants (guests) to view the courseware, and provide feedback regarding perceived strengths and weaknesses of the interface and learning design. The listservs included: the Tasmanian Society for Information Technology in Education (TAS-IT), which is a forum for Tasmanian educators with a particular interest in IT; the International Forum of Educational Technology and Society (IFETS), which is a worldwide forum for educators and those whom develop and implement educational technology; and lastly, the Instructional Technology Forum (ITFORUM), which is a worldwide forum for people to discuss theories, research and practices relating to educational technology.

Seven participants provided feedback via email to the researcher, in response to the invitations on the listservs. As the respondents were virtually based, they would not be walked-through the courseware in person. In respect of this, the researcher made a point of noting in the invitation that the courseware was a prototype only, and asked participants to provide feedback keeping this in mind. They were also asked to incorporate feedback relating to the user-friendly and learner-friendly design as opposed to subject matter expertise of the course content (see Chapter Three and Appendix). It was anticipated, that enabling feedback from a wider range of participants, would enhance the validity and reliability of the qualitative research, and broaden the scope of the response. Furthermore, the highly open-ended nature of the question was intended to enable participants to make uninhibited statements about courseware, and thus communicating their experience to the researcher from their perspective.

When it came to the face-to-face interview, participants were sent an email a few days beforehand. It included the URL of the courseware, and a request to spend some time familiarising themselves with the courseware and come to the interview with a note of any design issues which they perceived as strengths or weaknesses. Not all participants had the opportunity to fulfil this task before the interview unfortunately, however they did get an opportunity to walk-through the courseware during the interview. Directly preceding the interview, the participant was asked ‘What does the term courseware mean to you?’ After answering this question, the researcher described the interview process, which itself took up to 40 minutes. The researcher then took around ten minutes to walk the participant through the courseware prototype. Then, after checking whether the participant had any issues, the researcher asked the following questions:

(Q1) In your opinion, does this courseware provide user-friendly design? Is it relatively easy to use?

(Q2) Usability features of courseware are not always considered. What usability features would best help you learn? For example, the navigation, Start Tips, help button, site map.

(Q3) The visual design of courseware is not often considered. What do you think of the visual screen design?

(Q4) What do you think of the mix of graphics, video and courseware presented in the courseware? Is it helpful?

(Q5) What do you think of the amount of instructional guidance? Is it clear, too much, too little, too vague?

(Q6) What to you think of independent learning? Do you think this courseware can encourage this?

(Q7) Courseware design often just gives notes, however many researchers believe courseware should encourage people to think deeper. Do you think the courseware does this to some extent?

(Q8) When you look at the courseware what appeals to you? What do you think is good, and what do you think needs improvement? For example, the design of the navigation, the visual design, the activities, the learning sequences, the assessment, the learning environments?

The first three questions focused on user-friendly design, and the following three questions focuses on learner-friendly design. The open-ended nature of the wording and other questions however allow for new themes to emerge. They may also help contradict/explain the questionnaire results already identified.

The researcher followed Seidman's (1998) guidelines for interviewing. Seidman recommends that the researcher: ask open-ended questions that does not force a prescribed answer; enables the interviewee to adequately reconstruct their experience; following up on relevant cues and asking questions where necessary; and to tolerate silences and explore laughter. Seidman notes "Every aspect of the structure, process, and practice of interviewing can be directed towards the goal of minimizing the effect the interviewer and interviewing process have on how the participant reconstructs their experience." (p.16). In order to achieve this, the researcher attempted to create a relaxing atmosphere, to encourage the participant to voice their perspective on courseware and any related teaching and learning online issues. As such, the interview process was highly flexible as opposed to being prescribed.

For instance, during the walk-through of the courseware many participants volunteered open-ended feedback here about specific aspects of the courseware, or teaching and learning online. Some of this feedback often related to one of the interview questions that the

participant would have been asked after the demonstration, however the researcher encouraged the participant in reconstructing their experience then, rather than memorising them for later, in order to obtain the most meaningful perspective. In another example, the informal nature of the interview meant that some participants' felt comfortable in expressing their own experiences with teaching and learning online (as opposed to the courseware). This greatly contributed to the quality of the research. Finally, seven of the questions above are directed at specific areas of user-friendly and learner-friendly design, however the last question asks the interviewee to elaborate upon any perceived strength or weakness of the courseware. This provides the opportunity for the interview to provide a wholly subjective interpretation of the courseware, and gives the researcher an insight into which features may have been more successful than others.

The participants evaluating the courseware represent the range of occupational types defined in the questionnaire. Many of the participants' occupations stem multiple backgrounds, as indicated in Table 6.2.2(b) and Table 6.2.2(c) below. As mentioned earlier, the participants were chosen because they represent a range of identified and non-identified backgrounds. The intention was to obtain opinions from a broad spectrum of participants, to adequately evaluate the courseware from a more objective point of view. It was anticipated that these participants would be able to enlighten the researcher on some of the themes already identified, and provide insights into new themes. For example, the questionnaire data that has been presented showed that there were differences of opinions between academics, students and professionals in regards to teaching and learning online. Therefore, a range of participants was chosen who represent these groups. Furthermore, many of the participants represented multiple groups, whose perspective can be informed by 'competing' groups whom appear to disagree. For example, one postgraduate student of Education (P5) also works casually as an academic in Education, as well as a professional instructional designer. Since the participant group were to chosen to represent a range of identified (including a variety of age groups, genders, occupations, and familiarity with teaching and learning online), and non-identified backgrounds (including non-native speakers of English), the researcher assumes that the resulting feedback will confirm, contradict and/or enlighten the thesis on existing and emerging issues according to participants' background and experience.

Table 6.2.2(b) Description of face-to-face participants undertaking courseware evaluation interview

Participant (P)	Gender (M-Male/F-Female)	Primary Occupation (Academic Education (A_E) Academic Other Disciplines (A_OD) Student Education (S_E) Student Other Disciplines	Secondary Occupation(s) (Not Applicable/Not Sure (N/A))

		(S_OD) Professional Instructional Designer (ID) Professional Web Developer (WD))	
P1	M	A_E	ID, WD
P2	M	A_E	S_E (postgraduate)
P3	F	A_OD	S_E (postgraduate)
P4	M	A_OD	ID, WD
P5	M	S_E (postgraduate)	ID, WD
P6	F	S_E (postgraduate)	N/A
P7	M	S_E	N/A
P8	M	S_OD (undergraduate)	N/A
P9	M	S_OD (undergraduate)	N/A
P10	M	S_OD (undergraduate)	N/A

Table 6.2.2(c) Description of web-based participants evaluating courseware

Web Participant (WP)	Gender (M-Male/F-Female)	Primary Occupation (Academic Education (A_E) Academic Other Disciplines (A_OD) Student Education (S_E) Student Other Disciplines (S_OD) Professional Instructional Designer (ID) Professional Web Developer (WD))	Secondary Occupation(s) (Not Applicable/Not Sure (N/A))
WP1	F	A_E	N/A
WP2	F	S_E (postgraduate)	ID, WD
WP3	M	ID	A_OD
WP4	F	A_OD	N/A
WP5	F	ID	WDN/A
WP6	M	A_OD	N/A
WP7	M	S_OD	WD

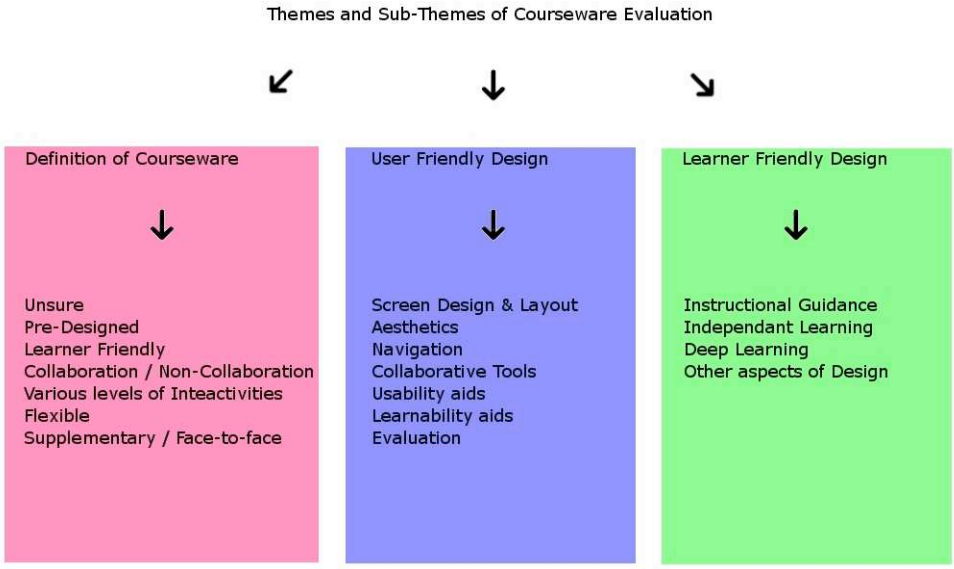
From here on participants will generally be labelled by their acronym: academics from Education (A_E); academics from Other Disciplines (A_OD); students from Education (S_E); students from Other Disciplines (S_OD); professional web developers (WD); and professional instructional designer (ID).

6.2.3.2.2 Emerging Themes

Several themes emerged during the interview process, and more became apparent during the process of transcribing the interviews. Both the interview and web-based feedback was analysed during the coding process, and several sub-themes emerged from the analysis of the courseware evaluation. Some of these themes and sub-themes have already emerged from the questionnaire analysis, for example the sub-themes ‘screen design and layout’, ‘aesthetics’, and navigation’. Other sub-themes emerged for the first time in this research, for example the sub-themes on ‘evaluation’ and ‘other aspects of courseware design’, Surprisingly, the researcher found that some concerns of participants regarding both teaching and learning online, and specific aspects of the courseware design were rarely or

perhaps never been expressed in the literature on educational technology. Whilst the focus of the courseware evaluation was the design features, many participants used this opportunity to express particular concerns with their experiences as students, designers and developers of teaching and learning online. On the other hand, the criticisms, observations, and compliments communicated by the participants also highlighted an understanding of the perceived weaknesses and strengths of the courseware. It also provided the researcher with a more sophisticated record of factors contributing to effective courseware design. Figure 6.2.2(b) shows the emerging themes, directly below. These will be discussed in detail, further on in the Results component of this chapter.

Figure 6.2.2(b) Themes and sub-themes of courseware evaluation



6.3 Results

The results of the open-ended questionnaire, and then the courseware evaluation will be discussed below. Figures 6.1 and 6.2 displayed in the previous sections indicated the major themes that have emerged for each of the qualitative analysis. These themes will be addressed linearly, and their sub-themes will be discussed in their entirety. If relevant, some connections may be made between the analysis of the open-ended questionnaire and courseware evaluation, however the intention is to triangulate the findings in the Conclusion Chapter that follows this. The Discussion that follows the Results section here will summarise the major findings from this chapter. The data stems from a range of participant types, however the researcher would like to emphasise that the analysis will focus on the general nature of feedback from participants, for instance, whether that be a consensus, disagreement, or variation of opinion. The feedback is considered particularly interesting or relevant, and then the participants' occupational background will be indicated.

6.3.1 Open-ended Questionnaire

6.3.1 Theme: Teaching and Learning Online: Strengths and Requirements

Participants view the strength of courseware as a learning-aid that connects them to course-related resources, as well as the instructor and other learners. They require courseware that is well-designed (user-friendly and learner-friendly), as this significantly affects their motivation, their ability to teach and learn via courseware, and their perception of teaching and learning online. Whilst user-friendly design in courseware refers to the ability for participants to use the software and hardware components of the courseware easily, learner-friendly design brings in the pedagogical component, so that learning is the focus of the software being delivered. The feedback also shows a strong preference for the face-to-face component of teaching and learning be maintained, so that the successful design of teaching and learning online should incorporate a blended learning environment, of interactive courseware and face-to-face and/or phone contact. Under this theme, the following sub-themes emerged: Learning Aid, Connectiveness/Interactivity, and Well-Designed.

(i) Learning Aid

Courseware is viewed as an important learning tool, in providing learners with course-related notes that supplement the face-to-face classes, and providing a portal for a wide-range of informative resources from journals and other sources that may be accessed quickly. For example, one student wrote: *"It seems pretty good at the moment. Lecturers putting notes online definitely help!",* whereas another students concern was *"When lecturers does not put notes on WebCT".* Another student believed that its strength is that it is "quick and informative". Whilst the www is a portal for users' to download and upload resources, arguably, it does not provide pedagogical guidance to learners. It is perhaps not surprising then, that the instructional guidance provided within courseware was viewed as one of its major strengths, as one student wrote that it is "*Easy (sic) to get what you want, instead of having to sort through useless information to get it"*.

(ii) Connectiveness/Interactivity

'Connectiveness' refers to the ability to connect to people and resources online. Courseware was perceived as being a powerful tool in connecting learners' with materials and tools that aid their learning. In particular, participants' expressed enthusiasm for courseware that enabled students to interact with the content, and undertake self-tests. For instance, participants state that they would like to see courseware include "*more opportunity for interactivity with the content", "Exploratory interactive practice", "Interactive browsing and quiz", and "More interactive feature (sic) – quizzes, multiple-choice".* There appeared to be a

broad definition for interactivity however, with this term being associated with both human-computer interaction and human-human interaction.

Human-computer interaction refers to interaction between the participant and computer only, and participants referred specifically to the use of multimedia objects like *"interactive/flash animations"*, and learning activities like "*Interactive activities that reinforce the learning."* Human-human interaction traditionally refers to interaction between participants on a one-to-one or one-to-many basis that is enabled through computer technology, and participants referred specifically to asynchronous and synchronous communication with the lecturer/other students. For example, one student wrote that they'd like to see *"Interactivity that allows for a chance to input, opportunities for asynchronous interaction with other participants but also allowing for face-to-face or otherwise phone contact"*. This quote also illustrates participants' desire for teaching and learning online to maintain and comprise high levels of face-to-face contact between participants and the instructor. According to this student, learning should include a blended-mix of interactive courseware and face-to-face or phone contact.

Courseware is viewed as a powerful mediator in connecting learners-to-learners, and learner-to-instructors, and creating a community-of-learners. *".* One student's dislikes is that:

> "*Some units are not online and it limits communication with the class – people you do not know personally. Sometimes you have questions & it is beneficial to be able to post them."*

This student saw courseware as an additional learning aid that connects learners' in a way that a solely face-to-face environment did not. Discussion boards and chat are seen as two ways in which courseware can enable an interactive discourse between participants. One academic from Education promotes the pedagogical strengths of synchronous chat as *"Students chatting to each other and sharing knowledge/understanding".* Likewise, another student replied that they like the *"Ability to chat to academic (sic) in real time".*

(iii) Well-Designed

The qualitative data shows an overwhelming consensus between participants for more effective user-friendly and learner-friendly design. In particular, it appears that user-friendly design appeared to significantly impact upon the ability for lecturers' to effectively teach online, and learners to effectively learn online. For example, feedback from one participant (A_E) indicates that the technical difficulties associated with the delivery of courseware design impacts upon their preference for teaching face-to-face, as they dislike "*Internet dependency – reliability of resources. I prefer to have interaction with and among students".* This is further supported by another participant (A_E) whom also dislikes the *"Low reliability of technology, etc".* An example of where usability affects the ability for students to learn is captured by one student whose only dislike of courseware is *"The steroid type of white and*

black features where student can easily dozed (sic) off". This text also indicates that screen design impact upon learners' motivation, with 'steroid' screen designs influencing some students' ability to remain 'alert' and 'focused' when using courseware.

Interestingly, as the majority of feedback related specifically to user-friendly issues, these issues appear to significantly influence participants' perception of teaching and learning online, and as shown briefly above motivation to use and learn via courseware. Nevertheless, there is agreement that learning remains a top-priority amongst participants. One student indicates this:

> *"The most importance (sic) 'feature' of courseware is that its design enables effective learning. This involves clear-headed analysis of the learning objectives of the course and the learning needs as well as the learning styles of the students involved".*

There are varying levels of difference in regards to what features participants regard as user-friendly and learner-friendly, and these are covered in detail in other parts of the Results. Participants' generally agree however, that courseware should be *"interactive, engaging and user-friendly",* and not include *"Bad design (buttons not working, etc)"* or *"complicated instruction".* The text of two replies by students' indicates the unanimity for courseware to be both user-friendly and learner-friendly. The first students says *"I would like to see courseware that is easy to use, provides instructions, and is not "hampered" by bright colours, extensive graphics or text that is lengthy (i.e. in long paragraphs)",* whilst the second would like *"Interactivity & functionality mix; achieve set purpose not frustrate the user – clear instructions, good aesthetics".* This last example emphasises the need for courseware to be well-designed. It indicates that poor design may frustrate participants, and impact upon their perception of teaching and learning online.

6.3.1.2 Theme: Teaching and Learning Online: Concerns

Participants are overwhelmingly concerned about a range of issues associated with teaching and learning online. In particular, there is a shared anxiety amongst students and academics that teaching and learning may move towards a fully-online methodology, at the expense of a face-to-face component. There are three modes of delivering teaching and learning online (see Introduction): Supplementary (where online resources are used to supplement face-to-face learning, and online participation is optional); Web Dependent/ Blended (where learning includes both online and face-to-face participation, and the online component are compulsory); and fully-online (which contains no face-to-face component).

As mentioned above, some participants saw the strengths of courseware as supplementing existing face-to-face teaching, by provided access to resources such as lecture notes. Other participants indicate that courseware should be more than supplementary, and include higher levels of meaningful interaction between student-student(s), and student-lecturer, as well as

self-tests and assessment. There is consensus however, that existing courseware is difficult to use, impersonal, and often pedagogically ineffective. This perhaps points to why participants believe that *face-to-face really helps",* and why some participants have called for *"More face-to-face interaction".* Interestingly, neither of the professional groups expressed a concern that courseware maintain a face-to-face component, although an Instructional Designer commented that they'd like to see teaching and learning uphold a blended approach to *"Aim to even-out study experiences e.g. where students cannot physically attend f2f classes".* Under this theme, the following sub-themes emerged: Substitute for Face-to-Face, Time Consuming, Impersonal/Interactivity, Pedagogically Ineffective, Costly, Academic Use and Promotion, Poor Design, Unreliable/ Difficult to Use, and Ergonomics.

(i) Substitute for face-to-face

Both students and academics unanimously and strongly agree that courseware should not substitute face-to-face learning, and that teaching and learning within Higher Education should continue to maintain a face-to-face component. For instance, one student (S_E) orders "*Computers are not a substitute for face-to-face learning!!!*", whilst another student (S_OD) commands "*Face-to-face elements should not be completely eliminated*". The language from academics is equally forceful, with one academic's only dislike with teaching and learning online being "*That it may replace face-to-face contacts in the future*". Feedback from one participant (A_E) summarises the general opinion of most:

> *"I does not find it as easy to learn (or teach) this way as I do through direct (face-to-face) teaching – particularly with non-native speakers of English. I feel that face-to-face interaction is a necessary component because they can seek confirmation on the spot and develop a valuable relationship within the learning environment – so they does not feel isolated and unsupported"*

Here, on-line learning is perceived as a difficult mode to effectively teach and learn, and that face-to-face contact is necessary. The participant points out two features that make on-line learning pedagogically ineffective: that student-lecturer interaction is not immediate; and, that it leaves students feeling isolated and unsupported. There is general consensus regarding these concerns, and they are discussed more fully later in this section.

It should be pointed out however, that generally participants did not want to eradicate the use of courseware, merely to ensure that it is used in addition to face-to-face learning. For example, one academic replied that they would like to see courseware being:

> *"Used an addition not as the sole form of learning"* as "*I strongly disagree with it being used exclusively."* Another academic says *"The on-line component of the unit I teach offer (sic) support to students only. Instructional material is not delivered solely on-line"*.

This participant would like to see a mixed-mode learning environment, where courseware is used to support student learning. There were however, two negative replies that came from students, and which appear to indicate a strong dislike of courseware. These students' only dislike of courseware is *"Them be used"* and *"I hate computers in general, so this is one more reason not to like them"*. It should also be pointed out here, that the lack of feedback from the professional groups here is interesting. The quantitative results show that when it comes to whether online participation increases their motivation more than face-to-face learning, of all the Occupational groups these groups were closes to disagreeing.

(ii) Time-consuming

There has been increased focus in the past decade years, from delivering teaching and learning within Higher Education face-to-face, to utilising web-based resources for web-supplemented, web-dependent, and fully-online courses. This shift has been mirrored within the professional training field, with experts such as Richey, Morrison, and Foxon (2007) pointing out that the growth in instructional design practice has coincided with the growth in employee training in business and industry settings, and "The most prevalent applications of instructional design now occur in corporate settings" (p. 181). Perhaps due to the frequency and commercial nature of corporate courseware, the responsibilities and different expertise involved in designing and delivering corporate courseware are well defined, and generally aimed at saving time and therefore money. The roles of Instructional Designer, Subject Matter Expert (SME), web developer (WD)/programmer, graphic designer, project manager, and online facilitator are generally assigned to separate people/departments with these recognised skills. Within Higher Education however, the tasks of designing, developing and delivering courseware appear to be less well-defined. There is a greater emphasis on academics' undertaking the multiplicity of the roles listed above, despite the fact that these are very unique skills requiring specialised training. There still appears to be limited awareness regarding how the worldwide transgression towards online modes of study has impacted upon lecturers,' and how this effects on their workload.

The qualitative feedback here shows that this expectation upon academics' to fulfil the multiple roles of Instructional Designer, Subject Matter Expert, Web Developer, and online facilitator had added significant strain to academics' workload. Academics' are highly concerned with the amount of time it takes to design, deliver and maintain courseware. As one participant quotes, it is *"… hugely time consuming for teachers to produce, update and provide feedback at [the] same level as for face-to-face teaching".* Academics are particularly concerned by the added workload in the *"expectation by students that you'll answer emails instantly"*, and likewise students are concerned with the time it takes lecturer's to reply to their emails/discussion posts. Both academics and students however, point out that the lack of immediacy on existing modes of online interaction is pedagogically ineffective.

It should be pointed out however, that the general discussion on the inadequacy of online communication tends to refer to asynchronous modes of communication, and it is clear that most participants have experienced this mode of interactivity as opposed to synchronous modes. Whilst there is a general feeling by academics that courseware can be time-consuming, only one academic provides an in-depth insight into how the transgression into teaching and learning online has impacted Higher Education:

> *"[universities] Need to recognise the time issue in developing courseware (as an instructor). One student asked for notes to be in audio and text, one big problem is the extra time and effort involved. I went online because of the next generation. Basically, this generation are high computer users (timewise and finding information) and I recognise the pedagogy will have to change because this generation is different. I does not believe the older generation are as keen. I dislike the time it takes to develop [courseware] as it takes away time from my research and personally too"*

This participant (A_OD) sees the move to teaching and learning online as necessary, because this generation ('Gen Y') of university students are already highly proficient in using computers as both a resource and a learning tool. Nevertheless, this academic has two major concerns on the time-consuming nature of this pedagogical shift: firstly, that teaching and learning online adds significant strain to academics' existing workloads, as discussed above, which is not being adequately recognised by universities; and secondly, that this 'strain' means that this academic's decision to utilise courseware has taken away both her research and recreational time. There is a sense here, that whilst academics see the necessity to move towards teaching and learning online, the decision to deliver web-based courseware can be both a professional and personal sacrifice. On a last note, whilst this section has focused on the time-consuming nature of designing to delivering courseware for academics, it is worthwhile emphasising that there was no feedback from students regarding whether they saw courseware as time-consuming.

(iii) Impersonal/Interactivity

A major concern of participants is that courseware can be impersonal and emotionally detached, leading students with a sense of being unsupported within the learning environment, and resulting in issues on learner- motivation. For example, one participant dislikes that courseware *"Can be emotional and detached",* whilst another participant (A_E, S_E) says:

> *"I dislike the impersonal nature of courseware. I have used it as a student and it just did not work for me. I found it a very difficult way to learn".*

Another participant (A_E) agrees they dislike the "*Impersonal nature often of courseware inability to be interactive".* The qualitative data also shows that participants perceive the impersonal nature of courseware as being closely related to interactivity. In particular,

respondents believe that courseware cannot provide the same level of interactivity presented in face-to-face learning. For example, one respondent dislikes the "*Lack of personal contact and interaction – face-to-face"* on teaching and learning online. When it comes to the issue of interactivity, it appears that much of the critique here relates to asynchronous modes of communication. For example, one participant (*S_OD)* dislikes *"Maybe not being able to ask questions immediately and get direct help – there may be delays with the forums, etc".* Again, for this person, the most frustrating element of courseware is that they are not able to get immediate feedback, which they would otherwise get with face-to-face learning.

It may be that synchronous modes of communication – such as online chat, may enable more immediate levels of student-lecturer interaction, as well as decreasing academics' workload in replying to discussion posts and emails. Within the quantitative analysis, students were the only group whom tended to agree that online chat is an effective alternative to face-to-face learning. Although academics from Education were not sure, they were keener than the other Occupational groups, particularly professional Instructional Designers whom were closest to disagreeing. Interestingly, the qualitative feedback provides insightful feedback from these groups in regards to online chat, which supports and adds meaning to the quantitative results. For example, the main feature two of the academics from Education would like to see is the *"Ability to talk with lecturers online via chat programs"* and *"Chats in real time […] Students chatting to each other and sharing knowledge/ understanding".* Likewise, students are equally keen for more synchronous forms of collaboration. For instance like academics from Education, one participant (S_OD) would like to see the "*Ability to chat to academic in real time".* Thus, the feedback of academics from Education and students (all disciplines) supports the quantitative results, as these groups generally believe live chat will support student learning.

On the other hand, feedback from one instructional designer provides an insight into the quantitative results, and supports the researchers' concern that professionals tend to be out of touch with the requirements of learners. This instructional designer dislikes:

> "*Over valuing (and lack of evidence) to support the need for 'online discussion boards/chat'. There is a need for learner/peer collaboration, but the effectiveness of unguided/non-directed online discussion is questionable. The 'context' is the critical aspect here – when making online collaboration work. The cost of effective online collaboration (including extra preparation etc) versus standard face-to-face would be an interesting exercise".*

The feedback above shows that participants (A_E, S_OD) tend to disagree with this instructional designer, as there is strong support of the use of online chat. When it comes to discussion boards however, there is varied feedback and this will be discussed later in this chapter. The reference to the 'cost effectiveness' of online collaboration supports academics'

belief that courseware design, delivery and facilitation can be time-consuming (and thus costly). Nevertheless, it is perhaps this criteria for the design, development and delivery of components of courseware to be rationalised in terms of cost, that leads to poor design decisions. The issue of cost will be discussed in more detail below.

(iv) Costly

The literature on teaching and learning online within Higher Education tends to focus more on issues other than cost. The cost of courseware is closely associated with issues of time. To design, develop, deliver, and facilitate an online learning environment takes time, and assumedly therefore, money. Thus, the more time it takes to achieve the task(s) within the design-cycle, one must suppose the costlier the project. As mentioned previously, within the commercial sphere the project tasks are usually allocated to specialised task-groups. A project manager generally ensures that these groups work within a set project timeline, and therefore cost. Due to the projects' need to keep within cost-structures, design limitations are often set, and this is possibly to the detriment of a quality pedagogical model. Within Higher Education however, project timelines are often ill-defined or non-existent, and lecturers can be expected to undertake much of the design and web development work with minimal or no training. Furthermore, these tasks are generally defined as part of academics' duties, so they may not be renumerated for any additional workload. So, the 'cost' of an eLearning project within Higher Education, must be defined in terms of money and/or time.

The qualitative data shows that a concern about 'cost' is driving the design of courseware, by those involved in its delivery within both the commercial and Higher Education sectors. For example, to re-quote from the previous section, one instructional designer says, "*The cost of effective online collaboration (including extra preparation etc) versus standard face-to-face would be an interesting exercise".* Furthermore an academic from Education says, in relation to whether 'learners should be encouraged to be independent learners in using courseware', that it *"Depends on cost of support".* For both these participants, the cost of providing support for collaborative learning is a major issue in regards to whether this feature is utilised within courseware. Another way, in which the design of courseware is being dictated by cost, is provided within the feedback from an academic from Other Disciplines. When it comes to whether 'courseware should be used in addition to face-to-face interaction' she says, *"Students would probably says yes, but as a lecturer I say no due to the extra time and effort involved."* For this participant, the cost of providing blended learning in terms of time/effort outweighs the benefits of its delivery.

(v) Pedagogically ineffective

The central component of teaching and learning online should be that it enables effective learning. In the last few decades learner-centred pedagogical models, have been replacing

teacher-centered models within the classroom. Here, the focus is on facilitating meaning-making, so that the student becomes an active part of the learning process. This is in contrast to the former model, where the student is a passive recipient of knowledge, being dictated by the lecturer. This pedagogical shift has been mirrored to some extent within the realm of teaching and learning online. The problem here however, is that much of contemporary courseware design continues to deliver passive learning environments which are pedagogically ineffective. There may be several reasons for this, with a central one being that there continues to be some level of disagreement and confusion in regards to what constitutes learner-centered courseware within an online medium.

The qualitative research shows that there is a consensus amongst participants that the design of teaching and learning online may be pedagogically ineffective. For example, one participant (Instructional Designer) dislikes "*Applied pedagogical learning models that conflict with my personal learning approach*". A learner-centered model is designed around the needs and requirements of learners. If the courseware critiqued by this participant were genuinely learner-friendly, then it should not frustrate and impede upon the learning process. Concerns associated with interactivity have been addressed to some extent already. The interactive design for social collaboration is a specific feature identified as contributing to the pedagogically ineffective nature of teaching and learning online, perceived by both academics and students. There is general agreement in the literature that social collaboration is a necessary part of the learner-centered model, enabling students' to develop and refine their knowledge structures on course content. There is some variation of agreement however, in regards to how to utilise the collaborative tools within courseware, and whether fully-online courseware can effectively support social interaction for learning.

Within the qualitative data here, participants believe that online interaction can be ineffective compared to other forms of social interaction, when it comes to supporting student-student, and student-lecturer learning. For example some participants view courseware as non-interactive, and believe the lack of face-to-face participation can be a disadvantage to the learning situation. One participant's (S_OD) only dislike is 'No face-to-face interaction'. If unsure about text cannot consult lecturer straight away." Another participant (A_OD) provides more information:

> *"Need to find a program that duplicates/replicates face-to-face social interaction/phone interaction. So much information is lost from online interaction, such as the nuances of discussion and arguments in face-to-face tutorials"*

For these participants, the pedagogically ineffective nature of courseware is directly related to the inability of existing courseware in providing more effective forms of synchronous collaboration. Some academics believe this impedes upon their ability to support students. For instance, one participant (A_E) says that it is "*Difficult to identify students having real*

difficulties – interpersonal aspects. Lack of immediacy of interaction." Another participant (A_OD) dislikes the:

> *"Lack of opportunity for oral presentations; restricted discussion and feedback for those with learning difficulties/lower literacy levels (visual art has 'non-traditional' early requirements therefore literacy and computer literacy a huge problem".*

The researcher considers it important to point out, that part of the concern regarding courseware here, centres around its inability to mimic face-to-face courseware. Interestingly again, it appears that the critique of courseware by academics' above, is associated with asynchronous modes of communication. Although academics' responsibilities lay in the instructional design, their feedback indicates that they appear to be unaware of the pedagogical objects that may aid their delivery of 'oral presentations' and more 'synchronous' levels of communication. There appears to be limited feedback regarding participants' experience with synchronous tools, and this may to indicate a lack of experience and/or education regarding the use of various pedagogical tools that may aid the delivery of teaching and learning. The researcher speculates, that this could contribute to the confusion and/or negativity associated with chat tools by academics' and professionals in the quantitative data. This data, discussed in the previous chapter, showed that students were keenest on the use of chat, as an alternative to face-to-face learning, and that academics and professionals were least keen.

(vi) Academic Use and Promotion

The past decade has seen significant growth in the uptake of teaching and learning online within both Higher Education and the training industry. Arguably however, it is still a relatively new phenomenon. As such, there may still be a level of hesitation over its use, by some academics and students. For example, within the qualitative data one participant indicated a concern about the use of courseware. Generally however, there is a lack of negative feedback on the actual uptake of teaching and learning online. For instance, one participant (S_E) says about courseware: *"It seems pretty good at the moment. Lecturers putting notes online definitely helps!"* It appears that participants are not concerned that the Internet has permeated the consciousness of Education. This indicates that they recognise that some level of courseware delivery is now a requirement within Higher Education.

There was a lack of feedback from the professional groups in relation to the use and promotion of teaching and learning online however, so the concentration here is on students and academics. This is fascinating, as the professionals had relatively extreme opinions on teaching and learning online within the quantitative data, many of which were out of touch with those of students. As such, the researcher considered that they would be the most opinionated when it came to the qualitative component on issues of eLearning being used and promoted. Interestingly, the professional groups had the most to say, when it came to

the design of courseware – as discussed in the courseware evaluation component of this chapter. The qualitative feedback indicated that participants are concerned about the academic use and promotion of courseware. There are various layers of anxiety here, and these will be discussed in the following paragraphs. To start with there were two replies from participants, indicating that they would like to see greater use of courseware. One participant (S_OD) indicated that they would like to see *"More academic acceptance, promotion and use of".* Another participant (A_E) agrees, that teaching and learning within Higher Education should include "*Better layout and more courses using the courseware".* The relatively recent uptake of teaching and learning online perhaps explains why the student above perceives a lack of academic acceptance when it comes to courseware.

Feedback from another participant (A_OD) may help provide an understanding into why courseware may not be better promoted by academics. This academic says that *"[universities] Need to recognise the time issue in developing courseware (as an instructor) […] one big problem is the extra time and effort involved".* This academic recognises that one of the major difficulties in promoting the use of courseware by lecturers is the apparent lack of institutional support in regards to its design and development – as also discussed earlier in this chapter. It is interesting that the qualitative feedback in support of courseware's promotion, stems from students and an academic from Education, as the quantitative findings showed that these groups were the most supportive in regards to whether online participation increased motivation more than that of face-to-face. The statistical data also showed however, that these groups were also the most supportive of courseware being delivered as a supplementary and/or blended mode. In other words, whilst these groups would like to see more courseware being utilised and promoted, they are keen that a strong face-to-face element be maintained. Again, whilst there is a general acceptance that teaching and learning online will become an essential element of Higher Education, participants' are concerned about how this will be applied. Much of the qualitative feedback on teaching and learning online is focused on the various ways it can be used/delivered and designed to enable learning.

When it comes to the use of courseware, participants have varying concerns. To reiterate, both academics and students are concerned about the pedagogical effectiveness of courseware. Whilst they have some significant differences of opinion in regards to this however, much of the concern surrounds issues of interactivity. In particular, academics are concerned that existing courseware design cannot adequately support student learning online, due to its perceived inability to enable more synchronous levels of collaboration that mimic face-to-face learning. On the other hand, academics are also concerned with the time it takes to develop and deliver courseware – as mentioned above. This, along with a supposed lack of institutional support and knowledge on courseware design and its

development tools, may affect their ability to deliver courseware that better matches the requirements of both the lecturer and their student. It may also aid our explanation in regards to why some academics are hesitant in using and promoting courseware.

Expanding upon the above, although some academics from Education pointed out the need for chat programs to be utilised online, other lecturers appeared unaware that such tools can be used to foster more immediate levels of communication within a teaching and learning environment. In contrast to this, students appear much less concerned that courseware can support learning. That is, there appeared to be more acceptance of teaching and learning online by students, as compared to academics. Students are much more concerned about the way specific aspects of user-friendly and learner-friendly features may be designed to enable learning. When it came to interactivity, students agree with academics that enabling more synchronous peer-peer interaction would benefit courseware. They appear to be more knowledgeable though, in regards to the technical capacity of courseware, and are more specific in the type of synchronous tools that are utilised. This will be discussed later in the chapter. Finally, in regards to collaboration, there is consensus amongst students that lecturers need to take a more active role in facilitating peer-peer collaboration, and providing more timely feedback.

(vii) Poor Design

The design of courseware is a basic factor in maintaining and motivating students online. There is a growing literature base on learner-centered design, particularly those supporting constructivist-based learning environments. Much of the literature however, focuses on the theoretical underpinnings of the pedagogical design, as opposed to the way in which this can be developed within a fully-online courseware within Higher Education. There is also a gap in the literature on the impact of user-friendly design within a learning environment, such as how the use of colour may motivate learners within a fully-online courseware. Taking this, along with the experience and workload of academics into account for instance, it is perhaps not surprising that there continues to be confusion by designers and developers. Accompanying this is the dissatisfaction by students on the effectiveness of contemporary courseware design.

The qualitative data shows that participants agree poor design is a basic concern on teaching and learning online. Feedback indicates that design features are a basic reason for low learner motivation. As one participant (S_OD) states, their major concern is *“Boring and dull design”.* It appears that both user-friendly design and learner-friendly design impact upon the ability to learn online. When it comes to user-friendly design, poor screen design, slow download times, and issues associated with using a Learning Management System (LMS) are features that significantly affect participants’ perception of courseware. This is

summarised within the feedback of two participants (S_OD). The first dislikes *"Slow loading pages & pages that does not load. Load/bright colours. Hidden/unclear links. Very small icon links (especially printer links)".* The second dislikes *"Bad navigation/interfaces. Primitive navigation methods (such as current LMS Blackboard). Crappy text based GUI (Webraft)."*

When it comes to learner-friendly design, participants dislike information and graphics that doesn't match the instructional sequence, low levels of interactivity, and when the learning is not designed according to the online medium. The following comment summarises respondents concern regarding poor instructional sequencing, where one participant's (A_E) concern is *"When instructions do not follow the computer icons/tools that are being used. […] Huge chunks of information without organisation."* The following three comments by students express their dislike of courseware with low levels of interactivity, and those that do not use the online medium effectively. The first participant (S_E) dislikes *"Simple (sic) transferring text based content to digital text".* The second participant (S_OD) also dislikes *"Expanding and enhancing existing teaching and not just providing the same content electronically".* The third participant (S_OD) provides more detail:

> *"Anything that focuses more on content than interaction. Content can be found I books. Interaction is what adds to and enhances learning beyond pure content with real examples from participants".*

The comments above illustrate the point that poor user-friendly and learner-friendly design considerably effects learners' perception of teaching and learning online, their ability to learn via courseware and their motivation to learn. This is further emphasised by a participant (A_OD) whom is concerned about "*Bland "click through the links" style of courseware - followed by MCQ!".* Another participant (ID) agrees that a *"Completely linear approach"* is an example of poor design. For these participants linear sequencing adversely effects their perception of teaching and learning online, and the verb 'Bland' tends to indicate that it also impacts upon their motivation when using courseware.

(viii) Unreliable

The qualitative data shows that those within Higher Education observe that the resources required for eLearning are unreliable. This appears to negatively impacts upon the perception of teaching and learning online. Issues associated with hardware and software malfunctioning perhaps influences this perception. One of the components of user-friendly design is that the software and hardware being used is reliable. That is, that it generally works in a way that the end-user anticipates. The use of the Internet is now entrenched within popular work and leisure cultures. It has however, only notably permeated these cultures within the past decade, and as such is still a relatively new phenomena. Arguably, those involved in teaching and learning online may not have complete access to the computer technology required for the most efficient use of the Internet and particularly high-

end multimedia. Furthermore, this technology is still being designed and developed, and prototyped by software and hardware companies.

Academics from Education appear to be particularly concerned with the unreliability of computer technology. For instance, one participant (A_E) worries about *"Internet dependency – reliability of resources. I prefer to have interaction with and among students".* Their colleague agrees. They also dislike *"The unreliability of hardware/ software" and would like to see "Easier access to hardware"*. For the first participant, the unreliability of resources is a reason why they would like to interact with students face-to-face. This may help explain why academics from Education most strongly agree, that a face-to-face element must be maintained when using courseware, in the quantitative data. The effect of unreliable technology, appear to affect the smooth delivery of courseware in specific ways, within a teaching and learning environment. For example, for one participant (A_E) it involves *"Losing information because it timed out".* For other participants, it involves not being able to use or access the courseware due to the computer freezing. This issue appear to particularly affect students. For example, one student's (S_E) frustration is *"When the computer freezes".* Another student (S_OD) agrees:

> *"I use webct vista which is java based. It sometimes freezes and is difficult to operate with 'forward only' navigation. A much simpler and efficient software platform would make it much easier to study online."*

For this respondent, hardware and software difficulties make it difficult to effectively learn online, and thus negatively impacts upon their perception of online learning. Issues associated with compatibility and accessibility also affect students, although one web developer from Higher Education agrees that *"Computer software compatibility issues"* can be frustrating. For example, one student (S_E) would like to see *"Increased accessibility from home. Often timely or sometimes not at all".* Another student (S_OD) agrees. They comment, *"Making it more compatible with all operating systems, I have a Mac at home and can't access WebCT due to too high system requirements".* For these participants accessibility and/or compatibility issues actually prevent them from using the learning environment. In effect, the unreliability of the technology significantly affects both academics' and students' perception of teaching and learning online.

It is interesting to note here, that the professional group did not appear to be concerned about the reliability of computer technology. The researcher wonders whether this is due to these groups being better educated in regards to the design constraints on the delivery of courseware. In effect, the limitations of their clients software and hardware, are a built in to the design of commercial eLearning, whom depend on is smooth delivery. Pointing back to our earlier results, academics' perceive themselves to be in a pressurised environment to develop courseware, despite the time constraints and perceived lack of support. The

researcher wondered whether this impacted upon their ability to deliver the most effective courseware, for teaching and learning. Taking this into account, the research further wonders whether the concern about the reliability of courseware held by academics, may be influenced by a lack of training on the features and limitations associated with computer technology, particularly Learning Management Systems (LMS).

(ix) Ergonomics

The final concern on teaching and learning online, is one that has newly emerged from qualitative data. Much of contemporary teaching and learning online require some period of time sitting statically in front of a computer. The qualitative data shows that this negatively affects some participants' perception of teaching and learning online, from the older age groups. For example, one participant (A_E) dislikes that teaching and learning online involves *"Sitting (bad for over 50s) as a main engagement mode.* Another participant (S_E) also worries about *"The sitting down and indoor nature – ergonomics".* For these participants, the stationary nature of teaching and learning online, negatively affects their perception of eLearning. In light of this belief, the researcher wonders whether teaching and learning online should necessarily involve participant's being stationary for longer periods of time than that of face-to-face learning? For instance, should not those involved in eLearning be educated about the necessity of taking regular breaks, as one would in a face-to-face lecture? Furthermore, if the courseware was designed to encourage greater mobility amongst participants, would this enhance the opinion respondents have about eLearning? In a fortunate coincidence, the courseware developed by the researcher for participant observation is designed around the belief that learning enable greater flexibility of mobility. The analysis of results in the next section, will attempt to see whether participants perceive this in a positive light.

6.3.1.3 Theme: User-friendly Courseware Design: Requirements

The user-friendly design of courseware tends to be marginalised within the pedagogically orientated literature on courseware design, particularly within Higher Education. The intention behind any user-friendly design is to ensure the software product being designed is easy to use. Those specialising in user-friendly design centre the design methodology on the needs of the end-user. Within an educational setting however, it is significant that the end-user is a 'learner', as opposed to generic 'user'. So, the user-friendly design here should centre on the needs of the end-client as a 'learner'. The user-friendly design for learning should incorporate those features traditionally associated with user-friendly design. These include a consideration of the screen design and layout, navigational features, usability features, and technical limitations within the design brief. Since the context of the user-friendly design is specific to a teaching and learning environment however, the way in which these features are

utilised should be specific to this setting. There is a strong literature base on generic user-friendly design for website design, development and delivery.

On the other hand, there is a growing literature base on a user-friendly design framework for learning. Arguably however, there is still more work required within this area. For instance, do the features of user-friendly design impact on learning? If so, how to they impact on learning? Also, how does user-friendly design alter for a learning environment, compared to those of a generic website? This research attempts to answer some of these questions. Much of the qualitative feedback on the open-ended questionnaire data involved comments on user-friendly courseware design. It appears that participants would like to see courseware include more user-friendly design elements, and tend to be quite specific in their requirements here. This tends to indicate that there is a relationship between good user-friendly design and the capacity for participants to engage in effective teaching and learning online. As two students (S_E) say, they would like to see *"Any type of courseware that is interactive, engaging and user friendly",* and *"User friendly easy access courseware".* For these participants' their primary requirement surround effective teaching and learning online, includes the ability to access user-friendly courseware. Under this theme, the following sub-themes emerged: Effective Screen Design and Layout, Information Organisation, Aesthetically Pleasing, Flexible Navigation, Graphics, Multimedia Objects, Enhanced Usability, and ICT Support.

(i) Effective Screen Design and Layout

The concepts of screen design and layout are closely related, and are major components of user-friendly design. The screen design involves decisions on the use of colour, graphics, text, navigation, and layout. The layout of the interface involves making decisions associated with the location of elements such as menus, graphics, and text boxes. Participant's responses within the qualitative data show that effective screen design is one of the most important requirements of courseware design. For example, some of the feedback from participants' regarding what they would like to see within courseware, includes the following generic comments: "*Appealing, Not cluttered, Under categories/more organised content"* (S_ED)"; *"Easy to use layout → Not too much navigation"* (S_ED); *"Easy to read and understand. Clear design" (S_OD); "I would like to see courseware that […] is not 'hampered' by bright colours, extensive graphics or text that is lengthy (i.e in long paragraphs)" (S_OD); and,* "*Simple, uncluttered screen design"* (ID). There is a strong consensus that good screen design and layout should include uncluttered layouts, an appealing aesthetic, and a preference for graphics over text, small text boxes to enhance usability, and features that ensure navigational and informational elements are easy to find. Many of these elements will be discussed further in detail below, as separate sub-themes. The comments above indicate that good screen design and layout helps participants' use the courseware more effectively.

In particular, it appears to specifically affect participants' virtual wayfinding abilities. That is, their ability to orientate themselves online. Other comments indicate that screen design and layout may help participants' feel more at-ease within the online environment. As one participant (A_OD) comments, the "*site should be 'welcoming' and articulately presented".* Finally, the aesthetics of good screen design and layout appear to affect both usability and participants' engagement within the online medium..

(ii) Information organisation

Participants' would like to see courseware include effective information organisation. For example, one participants' (A_E) dislike is *"Huge chunks of information without organisation".* Information organisation refers to the way in which information is chunked together on a screen, to enhance usability. Good information organisation means that screen elements and content are easy to find. It also enhances the participants' wayfinding abilities, so they find the site's navigation is more logical, and better matches their own mental models of its functionality. As one participant (WD) comments, they dislike the "*Design of navigation by untrained developers", and believe that within courseware it should be* "*Ease (sic) to get what you want, instead of having to sort through useless information to get it".* Information organisation is traditionally linked to usability. The qualitative feedback shows however, shows that within an online teaching and learning environment information organisation should also be linked to learnability. There are two points here, both detailed below.

On one hand, good information organisation ensures that learning content is easily accessible. For instance, participants' dislike "*Hard to find readings".* In effect, the difficulty associated with accessing readings affects their ability to cover course content. It may also have a negative affect on their learning motivation. On the other hand, there is consensus that information organisation should be linked directly to the course learning outcomes. For instance one participant (S_OD) commented: "*The structure of the pages should be logically aligned with the teaching format of contents of the course. ie. by lectures, tutes, pracs or by subject breakdown".* Another participant (ID) agrees, and dislikes "*Poorly organised 'information dumps' with no clear guidance or course objectives".* Thus, information organisation specific to courseware should enable easier access to course content, and better match participants' mental models by logically aligning to the course outcomes.

(iii) Aesthetically pleasing

The aesthetics of screen design and layout relates to the visual arrangement of the interface. It includes a consideration of the types of colours and graphical elements that will be used, and how their combination will impact upon the 'look and feel' of the interface. Specific combinations of colours and graphical elements are sometimes used, in an informed effort to influence the end-user. For instance, bright colour combinations along with animated comic-

style graphics generally provide the impression of ‘fun’ and ‘excitement’. Within traditional website design, standards have been developed the use of specific visual combinations. For example, the combination above is often used for websites aimed at children or teenagers, or entertainment sites that wish to attract these target-groups. Like other elements of screen design and layout, the appropriate use of aesthetics indicates a level of professionalism. A well-designed site with attractive aesthetics can enhance end-user’s trust and confidence in the site. As such, the aesthetics of screen design are a particularly important element of commercial design. It is the first feature by which a site or software product is judged, and promotes the company’s branding. Furthermore, the aesthetical elements of screen design can influence usability, and therefore the real achievement of a site. For instance, using a lot of bright colours with low levels of saturation, or having text written in a light hue against a light background, may fatigue and distress the online reader.

Given the importance of aesthetics, it is surprising that there appears to be a limited literature base on the importance and impact of the visual screen design, within the research on Higher Education courseware design. In particular, do the standards of aesthetics for generic websites apply directly within learning environments? Also what is the impact of aesthetics to learning? One of the most interesting sub-themes from this research is participants’ requirement for courseware to be aesthetically pleasing. For instance, academics from Education comment that courseware should be “*Clear; easy to navigate; attractive visually”,* and “*That programs are visually pleasing”.* Like traditional aesthetic design the qualitative data shows that aesthetic design can influence usability. For instance, one student from Other Disciplines complains about “*Over-used graphics, backgrounds that makes text hard to read”.* It has been argued that there is an absence of theory on the importance of aesthetics as it pertains to designing Higher Education courseware. Nevertheless, there is a strong literature base on appropriate aesthetic combinations for usability, and it is clear that certain combinations – such as those that make text difficult to read, should not be used within any situation. The qualitative data from the previous section indicated that academics perceived themselves as unprepared for developing learning environments, due partly to a lack of time and training. This deficiency may be a reason for courseware continuing to utilise colour-combinations that contributes to usability problems.

Unlike traditional aesthetic design, it appears that colour is a particularly important requirement within courseware for a teaching and learning setting. Furthermore, there appears to be a link between colourful aesthetic design of courseware, and the ability for participants’ to maintain motivation online. Arguably, the current standard for websites orientated at an Education or Finance audience, calls for muted or monochromatic colour schemes such as blue/green and black/white combinations. This appears to be subverted here, as the qualitative data shows participants’ believe visually pleasing courseware should

be ‘colourful’. For instance students from Education comment that courseware should be “*colourful”,* have *“pink colours☺”, and* have “*Interesting and colourful visually please (sic) design and page set up”.* It appears that colour can help engage them within online learning environments. For example one participant (S_OD) says *“I’d like to see courseware that is more colourful and attractive. I find that I am keener to stay connected to the website if I’m engaged visually”.* Another participant (S_E) agrees, and comments *“[courseware] should have brighter colours, like kids websites, ‘cos they keep me more engaged, and therefore better able to focus on the content and learn stuff online”.* On a final note, it is interesting to point out these results contribute to the findings from the previous chapter. The quantitative data from the previous chapter showed that participants’ agree attractive screen design enhances their motivation. The results above provide further insight into this finding by showing that colourful interfaces are perceived as visually pleasing, and as such engage participants within the learning environment. On the other hand, the interface should ensure that the aesthetics are not ‘too bright’, to avoid usability problems such as visual fatigue.

(iv) Navigational Design

The design of the navigation is one of the most important elements of user-friendly design. It includes designing the location and contents of the menus, providing a structure to the site in terms of the way pages link together, and generally providing navigational directions to enable effective wayfinding. The quantitative results showed that generally learners strongly agree that learners should be given clear navigational directions when using the courseware. Likewise, the qualitative results show that the effective navigational design is one of the most important requirements for courseware. For instance, one participant (S_OD) would like to see *“Easy to navigate website and easily accessible and comprehensive help”.* Participants were not particularly expressive when it came to the navigational features they would like to see. On the other hand, they did indicate the features they dislike and these are discussed in the section detailing user-friendly concerns.

There are some comments however that may indicate that there is a relationship between navigation, usability, and learnability. For example, one participant (S_OD) comments in regards to what they would like courseware to contain *“Straight forward navigation and functionality features → ease of use is very important”.* For this participant, being able to navigate effectively aids their ability to use the courseware. It also aids their desire to learn, as they then note, *“Good graphical design of layout would encourage me to use it more”.* Other participants would like to see courseware contain navigational directions. For instance, one participant (A_E) would like to see “Clearer directions of use”. Another participant (WD) says within courseware it should be *“Ease (sic) to get what you want, instead of having to sort through useless information to get it”.* For these participants, the navigational design of courseware should be well-designed, to help learners’ understand what to do, and access

information that is relevant to their learning. It is worthwhile pointing out interesting phenomena here. The quantitative results show that all participant groups older than the youngest group 18-29, considered it statistically more important that courseware contain clear navigational directions. The qualitative findings here again support this finding. There is a consensus amongst the older groups, that clear navigational directions are required to aid the usability and learnability of the courseware.

(v) Graphics

The design of the graphical elements of the screen are a special skill, incorporates part of the aesthetic element of the screen design. It is often given limited attention within the pedagogically oriented discourse on teaching and learning online. Within the commercial sector of generic web design, the aesthetic design of the graphical elements remains one of the most important elements in ensuring the end-product is successful. On the other hand, whilst the graphic design is given more attention within commercial courseware design, there appears to be a limited awareness within the theory and practice of industry-based design of the effect of the graphic design upon the learner. The qualitative results show a strong consensus amongst participants that courseware should incorporate a stronger graphical component. For example, one participant (S_E) asks for *"More graphics",* whilst other participants (S_OD) would like to see "*More image type things- videos, graphics",* and *"the use of more graphics".* On the other side, one participant (S_OD) comments that they "*Also, dislike not having graphics".* Participants' are also specific in their requirement for graphics however. Firstly, they would like to see sophisticated graphics that are professionally designed. For example, one participant (S_OD) dislikes *"Courseware that features funny picture (sic) and weird navigation".* Another participant (ID) dislikes *"Cute cartoons".* Secondly, they would like to see graphical elements being used harmoniously with text elements, for reasons of usability. For example, one participant (S_OD) dislikes "*Over-used graphics, backgrounds that make text hard to read".* Interestingly, there appears to be a strong link between the use of graphics and learnability. That is, the ability to learn effectively online.

This is indicated in two ways. Firstly, there is a preference for graphics in replacement of long text blocks. Participants believe that long blocks of text affect their motivation to focus on the learning content. For example, one participant (S_E) dislikes *"Too much text and no visuals"*. Another participant (S_E) would like to see *"Lots of graphics & diagrams with limited blocks of boring text"*. The belief that long text blocks can influence learnability, is supported by another participant (ID), whom comments in their concern regarding courseware design *"Reading lots and lots of text off the screen - boring and uncomfortable on the eyes".* The second way in which graphics can influence learning is provided more directly. One respondent (S_OD) would like to see "*More graphics & interactive screens to reinforce*

learning content - more like online tutorials for computer programs". For this participant, the use of graphics can help reinforce the learning material. Lastly, it is relevant to point out here that all the comments concerning the requirement for graphics stemmed from students from Education students from Other Disciplines, and Instructional Designers. The majority of feedback however, came from students. It appears that academics and web developers whom are responsible for developing the graphical features, are least concerned about their use within courseware.

(vi) Multimedia Objects

Multimedia objects include graphics, video, sound, animations, and interactive activities that utilise these elements. The qualitative results show that there is a strong consensus amongst participant groups, that courseware should utilise multimedia objects. There is a particular emphasis however, that these objects be used within a learning context. This shows that there is a strong link between the user-friendly and learner-friendly design elements here. For example, one participant (A_OD) would like to see "*Highly interactive objects embedded in sound pedagogical design",* another participant (ID) requires "*More utilisation of multimedia to its full effect without being gimmiky".* Generally, students are more specific in regards to which multimedia objects they would like to see within courseware, and how they should be used within a learning context. Although, two academics have specified that they would like to see courseware include *"Sound"* and *"Video exemplars".* In particular, they would like to see animations that explain a concept. For example, one student (S_OD) would like to see "*Animated demonstrations or videos explaining a concept".* Another student (S_OD) agrees, and would also like to see *"An explanation using animation (not too much dense text".* Whilst one student (S_OD) dislikes "*Animations that distract from instructional material",* the participant's central concern is that animations be designed in a way that is pedagogically effective.

Students also agree that courseware should contain live video connections of face-to-face lectures. For instance, in their open-ended feedback regarding what they'd like to see within courseware, students (S_OD) comments include *"Video recording of lectures", "Online movies of lectures → ie. not just sound but slides too", and "Audio combined with lecture notes. Multimedia approach. Video better yet. Something that appeals to all learning styles".* For these participants, multimedia objects that combine sound and graphics should be used as to provide online versions of course lectures. For the last participant, the use of these objects may better target participants with different learning styles. Interestingly, one professional (ID) points out *"Appropriate media of still pictures are often better than moving video of talking heads or often marginally relevant visuals".* This comment contrasts from those of students, whom appear to prefer moving video with sound, rather than just visual content. It also tends support this thesis' belief that professionals tend to be out of touch with

the requirements and concerns of online learners. On the other hand, it may be that the preference of appropriately used still-pictures over moving video depends on the context of use. Further research in this area would help establish whether this is the case.

It is mentioned above that participants would like to see more multimedia objects being utilised, as long as they supports student learning. In support of this, there is a consensus amongst participants that courseware not over-use 'bells and whistles'. The concept 'bells and whistles' refers to design features, such as multimedia objects, which provide entertainment as opposed to learning value. For example, whilst one academic (A_OD) would like to see video exemplars, he would also like courseware to be *"Low glitz/high substance".* A professional (ID) dislikes *"very busy cluttered screens with a multitude of bells and whistle which tend to obscure the learning message".* Students also agree, as one participant (S_E) dislikes *"too many 'bells and whistle' like flashing pictures and multimedia stuff".* For these participants, it is very important that multimedia objects be utilised within a learning context. This is particularly interesting, as it emphasises a requirement for user-friendly design within courseware to be designed with a focus on effective learning. The difficulty however, is defining both how and which learning contexts multimedia should be utilised. For example, there is a preference for multimedia over text, to present learning content within the qualitative findings.

On the other hand, if multimedia is used within a fully-online courseware to present learning content, would participants consider this a distracting form of 'bells and whistles'? The quantitative results show that generally participants strongly agree courseware should contain a range of mixed modes, such as text, graphics, videos and sound. Academics strongly agreed, as did students from Education. Interestingly, students from Other Disciplines were less keen, and the professional groups were much less keen. The qualitative results however show that instructional designers and students from Other Disciplines in particular, had the most to say in regards to the importance of mixed media. These groups were most concerned that courseware avoids the use of 'bells and whistles', which may help explain why they were less keen on mixed-media than other occupational groups within the quantitative findings. For instance, within the statistical findings students from Other Disciplines and professionals were less keen than other groups on utilising mixed-media such as graphics, sound, and video.

(vii) Enhanced Usability

There is a vast literature base on usability design for generic websites. On the other hand, there appears to be a gap in the pedagogical discourse on usability design within teaching and learning online. Whilst many usability features may apply directly to courseware, more research is required into which usability features are important, and how these should be

designed for online learners. Perhaps as a result, many problems on contemporary courseware are issues associated with the usability design. The intention of usability design, is to ensure that the website is easy to use and does not frustrate the user. The impact of poor usability design is that simple tasks become complicated, and potentially unachievable. The implication of poor usability design within commercially orientated websites is that end-users spend less time exploring the site, they are less likely to return to the site, and they are less likely to access and download product and/or service information. Furthermore, if users are particularly frustrated with the site's usability, they will be less likely to purchase businesses products and/or services. The implication of poor usability design within teaching and learning online appears is less clear. As mentioned, usability design for courseware appears be a new area within the pedagogically oriented literature on Higher Education.

The qualitative results show that participants would like to see effective usability design within courseware. In their requirements for courseware design for example, one participant (S_E) comments *"Quick and informative, Easy to Use",* whilst another participant (S_E) comments "*Easy access and easy to use - not too complicated".* For these participants, their main requirement for courseware is that it is easy to use. The qualitative results also show that there is a strong consensus, that poor usability design affects their ability to teach and learn online in three ways. It affects their ability to access information, download that information, and use that information in a more timely and effective manner. As a result, participants require courseware that provides usability aids that handles these processes. For example, one participant (A_OD) comments that courseware should include "*Easily accessible audio files, Free download software, Compatibility with pc/mac, Speed […]".* Screen, layout and navigational design appear to play an important role here. For instance, as already discussed, particular colour combinations may make it difficult for participants to read text-based learning resources. Also, poor layout and navigation makes it wayfinding difficult, and influence learners' ability to access learning resources. The commonality amongst the elements here is that participants' require user-friendly design that is simple, uncomplicated and matches their mental models in regards to functionality.

There are several suggestions that commonly appear within participants' requirements for more effective usability design. One participant's only frustration regarding courseware is when there is *"no obvious help/questions area*", and this leads us into the first suggestion. There appears to be a consensus amongst students that courseware should include Help tools. For example, one participant (S_OD) would like to see *"Easy to navigate website and easily accessible and comprehensive help",* whilst another participant (S_E) requires "*Help bar to type in question you have and "courseware" takes you to that relevant info"*. The last comment indicates that Help sessions are an important mode of guiding learners', and enabling them to access learning content. In this way, there is a vital connection of usability

as an enabler of online learning. This theory is supported in the comments of another participant (S_OD) who says *""Help session is very useful because it gives guidance to students".* The quantitative results from the previous chapter show that although students strongly agree that usability is an important component of courseware, academics and instructional designers consider this more important. The feedback directly above enlightens the research, by indicating which usability aid students consider important within courseware.

Another participant's (S_OD) comment that courseware should include *"Clear explanations of how to use site and where to access help",* leads us into the second suggestion participants make. They suggest that courseware include clear instructions, not only on how to navigate the courseware, but also how to use the courseware. There are some specific requirements offered by participants to achieve this. One participant (ID) suggests *"An attention gaining device or facts early on in the course".* Taking this suggestion and the above comments by students into account, the researcher ponders that effective courseware should route learners' through a help session guiding them in how to use the courseware when they first explore the courseware. Fortunately, the courseware prototype utilises this design feature. As such, the researcher directed open-ended questions during the interview, to discuss to see how effective this feature is in practice. Details will be provided in the courseware results section. Respondents strongly believe that usability explanations should be expressed in a simple, straightforward, and concise manner. As one participant (S_OD) comments, there should not be *"lengthy text (ie. long paragraphs), technical jargon [or] a lack of instructions".* Another respondent (A_OD) adds support to this argument. He says, the *"site should 'welcoming' and articulately presented, e.g. good writing style, clear use of language, must use language well".* The results from the teaching and learning component of this chapter show that participants' are concerned that courseware is impersonal. The last comment may indicate that a welcoming style of language helps personalises the learning environment.

This leads us into our third requirement for usability design. The qualitative results show that several participants' would like to see more advanced usability aids in the form of personalised pedagogical agents. For example, one participant (S_OD) would like to see "*More humanistic/ human pedagogical agents to direct instructional material".* Another participant suggests *"A cute pet (guide) like a cat for computing".* It may be that these tools further help personalise the learning environment. Thus, the researcher tentatively suggests that the pedagogical agents may be used to help participants' ability to use courseware become more intuitive. This adds to the corpus of data being gathered within this chapter that links user-friendly and learner-friendly design. Lastly, it is relevant to point out that within the statistical data web developers considered it much less important than other Occupational groups that Courseware utilise effective usability. The importance of usability

aids also appeared to be less significant to this group within the qualitative data. Interestingly, this group are particularly opinionated in regards to the learning design. Furthermore, these opinions tend to be out of touch with other occupational groups. This will be discussed later in this chapter.

(viii) ICT Support

The final component within this sub-theme is ICT Support. This refers to hardware and technical support, and it differs from the previous sub-theme as it includes a particular emphasis on the technical aspects of delivering courseware. The qualitative findings show that participants would like to see higher levels of ICT Support. For example, one academic (A_E) would like to see *"Manualized instruction in its use being part of each subject guide. More ICT support in teaching students how to get the most out of the courseware".* Students support this requirement, for instance one respondent (S_OD) calls for *"More explanation of what WebVista has to offer to new students. Lecturers took it for granted first years would know how to use it but I did not".* Some respondent's belief that ICT Support should be provided on a face-to-face basis. For instance, one participant (A_OD) would like to see *"Interactive access to human resource for help".* Whilst there is consensus that more ICT support is needed, there may be some confusion in regards to who provides this support. For instance it is unclear whether the academic above believes it is the lecturer's role to deliver this support. From the students' perspective however, it is the lecturer' duty to ensure they are able use the courseware from a technical perspective. In another light however, the chapter has already shown that academics' require support in developing courseware. In general, the perceived lack of ICT Support may be due to academics' inability to provide it, for a number of reasons.

Addressing different levels of computer literacy is an important part of user-centered design. Designing for different levels of computer literacy, is a way in which the workload on ICT Support may be partly ameliorated. The previous chapter illustrated statistical significant differences in the way participants perceive and experience courseware, according to their level of computer literacy. For example, participants with the highest levels of computer literacy believe good usability design is significantly more important than those with average computer literacy. Interestingly however, only one participant (A_E) requested *"Courseware that caters to a broad spectrum of computer literacy"* within the qualitative findings. On a final note here, the researcher would like to quote one instructional designer, whose concern is *"low value learning supports"*. As this participant does not elaborate, it is unsafe to make assumptions about which support features are considered unimportant. It is however relevant to point out that so far, there has been a strong call from participants for a higher level of ICT Support and Usability Aids, in a multiplicity of ways. Only some of which are addressed within this chapter. Furthermore, there is a gap in the academically oriented literature on

design guidelines for learning supports. Thus, this may be another example in which practitioners are making design assumptions that are out of touch with the needs of learners.

6.3.1.4 Theme: User-friendly Courseware Design: Concerns

It has already been discussed that the user-friendly design of courseware tends to be marginalised within the pedagogically orientated literature on courseware design, particularly within Higher Education. Furthermore, there appears to be a gap in the literature on the user-friendly design as it applies specifically to courseware. Therefore, this research intends to look at some of the features of user-friendly design within this environment. There is however, a strong literature base on the user-friendly design for generic software and websites. Some user-friendly features should arguably alter within a learning environment, and this research may help uncover some of these features. It should be safely assumed however, that a number of generic user-friendly design components could be applied, to contribute to effective courseware design. The questionnaire data shows that contemporary courseware tends to lack some of the basic components on user-friendly design, such as having workable hyperlinks.

The earlier results indicated a tentative relationship between good user-friendly design and the capacity for participants to engage in effective teaching and learning online. These results show that within this research, there is beyond doubt, a strong relationship between poor user-friendly design and the capacity for effective teaching and learning online. For example, one participant (S_E) comments *"[…] ease of use is very important. Good graphical design of layout would encourage me to use it more".* This feedback indicates that poor user-friendly design discourages this respondent from using courseware. The qualitative results show that the major concern participants' have on contemporary courseware design is poor user-friendly design. These concerns will be discussed in the following parts of this chapter. Under this theme, the following sub-themes emerged: Poor Screen Design and Layout, Aesthetically Steroid Interfaces, Navigational/Wayfinding Problems, User/Learner Control, Inconvenience, Technical Problems, Accessibility, LMS.

(i) Poor Screen Design and Layout

The previous section discussed participants' belief that effective screen design is one of the most important requirements for courseware design. It also pointed out some specific features that are required within the interface design. Conversely, the qualitative findings also show that participants' are highly concerned about poor screen design and layout. Some participants' offer general comments address their concern here. For example these include a dislike of *"Poor interface design and inflexible navigation"* (ID)*, "Poor layout and screen design"* (S_OD), and *"Poor navigation and layout"* (S_OD)*.* Other participants' offer more specific comments. In particular, there is a strong dislike for cluttered and busy layouts. For

instance, one student (S_OD) comments *"I dislike clutter, so anything needs to be set out clear and concise".* Another participant's (ID) concern is "*Interfaces that try to fit everything on one webpage/screen thinking this will be more convenient, although actually making interface too busy".*

The quantitative findings from the previous chapter show that statistically participants agree that screen design and layout affects their ability to use the courseware, although there was some division of opinion. Academics and professional instructional designers strongly agree, whereas students and professional web developers just agree. The qualitative results, such as those above, provide further insight into these findings. They show that whilst students are concerned about poor screen design and layout, they do not always link these features to usability issues. On the other hand, comments from academics and instructional designers tend to indicate a greater concern for how these features affect usability, and sometimes learnability. For example, like other students commenting here, the student above dislikes poor screen design and layout however they does not necessarily link this to any specific usability issues. For the instructional designer however, there is a belief that cluttered layouts compromise the courseware's usability. The following comment will further expand upon the theory that screen design and layout tend to have a greater affect on usability and learnability for specific groups. One participant (A_OD) states:

> *"I dislike ones that are difficult to use, and poorly designed. For example, the text and graphical instructions and screen layout of the university library's eReserve website are confusing, and make it difficult to use, and difficult to work out how to access learning resources.*

It could be argued that the comment above refers to generic websites, as opposed to courseware. The researcher considers it relevant however as it is an assumption that academic courseware generally links to the university's library site. As such, this feature can be thought of as an asset to courseware, and therefore judged as a component. For this lecturer, screen design and layout affect their ability to use courseware, and download learning resources. The text-based instructions also play an influencing role here too.

(ii) Aesthetically steroid interfaces

The qualitative results show that the aesthetics of courseware are a particular concern amongst participants. In some cases, participants make a direct link between aesthetics and their level of engagement with the courseware. Students from Other Disciplines are the most vocal about the aesthetics of courseware. In particular, they have a particular dislike for interfaces that do not use graphics and colour in a way that attracts learners' attention. For example, one student (S_OD) dislikes *"Sterile looking interfaces".* A comment from another student helps enlighten us on this comment. This student complains about "*The steroid type of white and black feature where student can easily dozed (sic) off*". This last comment

indicates a link between aesthetics and learner engagement with the courseware. It also adds to the argument that participants believe, appropriately used and designed, colour should be a requirement of courseware. As a fellow student (S_OD) says, "*Design and colours that cause an eyesore or are 'unattractive',* should be avoided.

When it comes to other occupational groups, there are a couple of conflicting opinions. For example, one student from Education also dislikes *"boring and dull design"*. On the other hand, a fellow student from Education is worried about *"overly creative design".* An instructional designer shares this concern about overly creative design, as they say "*I have a horror of material which preference presentation over participation".* It is impossible to extrapolate from the penultimate comment, exactly which features are considered 'overly creative'. It is clear however, that the pedagogically oriented component of courseware is more of a concern for some participants. The concern that courseware should be focused on the pedagogical elements, may help explain why the quantitative results show that participants agree – as opposed to strongly agreeing, that attractive courseware enhances learner motivation.

Finally, there is however a united concern amongst groups that the design of interfaces often includes too much dense text. For example, one participant (ID) complains about *"Reading lots and lots of text off the screen – boring and uncomfortable on the eyes".* As it has already been pointed out, participants strongly agree that courseware should include more graphical elements, and the existence of long text blocks affects both usability and learnability. It should also be pointed out here, that there may be a perception that text-boxes do not incorporate a component of the interface's aesthetic. If one assumes that the definition of aesthetics includes the imagery of screen elements, then it should include a consideration of text as it appears visually. The researcher therefore wonders this may help account for some level of inconsistency between the quantitative and qualitative results in terms of how aesthetics affect learner motivation. That is, the qualitative results show that the aesthetics of screen design are one of participants' central concerns. Based on the quantitative results however, it appears that a consideration of aesthetics are important, however not imperative for effective learning.

(iii) Navigational/Wayfinding Problems

Navigational and wayfinding problems are one of the most frequently listed concerns amongst participants. Common dislikes for instance, include *"Difficult to navigate websites"* (S_OD), and *"Courseware that features […] weird navigation"* (S_OD). Many respondents do not elaborate on what navigational features are considered 'weird', however it is clear that the main issue is that existing navigational design needs to be more intuitive. Designing more intuitive navigation continues to be an issue within the theory and practice of generic website

design. Assumedly, it becomes even more problematic when designing courseware for teaching and learning online. The qualitative results within this research appear to support this claim. There are a range of comments that are more specific in their concerns on courseware navigation and wayfinding. Some of these, such as those on structure and navigational tools, include potentially conflicting responses for participants. Some of the specific concerns will be addressed below, followed by those that appear to be at odds.

The first concern on navigation is what one participant (S_E) calls *"excessive clicking for getting to a destination"*. In particular, there appears to be significant levels of dissatisfaction with the perceived navigational limitations of Learning Management Systems in regards to this concern. Furthermore, this concern appears to be a concern specific to those within the discipline of Education. One respondent (S_E) complains about *"Having to go in and out of windows to move from page to page"*. This phenomenon emerged as a feature of the WebCT Learning Management System. For instance, one participant (S_E) complains, *"In our webct vista you can only have it open in 1 window at a time".* Another participant (S_E) is more specific:

> *"When you have to keep going back out of windows to get to where you want to go. For instance - when you use WebCT you have to go university home to utilise the webmail."*

In another WebCT related complaint here, one respondent (A_E) complains "*You have to start at my webct if you want to open a pdf file or another file. This makes you go to take topic you want twice".* For these respondents, excess clicking affects their ability to use the courseware, and access learning materials. In this way, it also affects learnability. The second concern surrounds navigational flexibility, and it appears to be a particular concern amongst a few professional instructional designers. For instance, one instructional designer dislikes *"Poor interface design and inflexible navigation"* (ID). It is difficult to theorise upon this open-ended claim, as it is so general. The comments of a colleague however, show that the concept of flexible navigation is related to navigational adaptability.

> *"Sound alternative navigation system tasks ← → Info interchangeability (sic) to cater for different learning skills, ie 'give me all the necessary info/tools/skills before presenting the tasks' vs 'just tell me the required outcome and I will require the required expertise on an as needs basis'*

This designer suggests designing an adaptable navigation system to cater for different learning skills. One navigational option would be to progress the learner through a series of content screens, before presenting the task-based activities, and therefore covering the necessary content and activities relating to the learning outcome. The second navigational option would be to inform the learner early on in the courseware what the learning outcome is, and letting them flexibly navigate their way through any content and task-based activities themselves. This comment indicates that designing navigation is strongly linked to the

learning design. As such, it brings in an element of complexity and transience, as there continues to be some level of debate, regarding educational philosophies. Also, whilst there is a growing literature base in the area, there continues to be perplexity in regards to applying these educational philosophies. The third concern surrounds the structure of navigational design. In many ways, the structure of the courseware is determined by the philosophy behind the learning design. For example, within traditional courseware based on behaviourist psychology generally comprises a linear navigation structure. The guidelines for the structural design of constructivist based learning environments are less clear. Nevertheless, many contemporary courseware designs based on constructivist psychology tend to include more open-ended navigational structures. The qualitative results show that participants do not agree upon a preferred navigational structure. Interestingly, the results also show that there continues to be a range of perspectives regarding a preferred learning methodology, although this will be discussed later.

Some participants dislike "*Programs that have you move around too much"* (S_E), and prefer more linear structures. Other participants, such as the instructional designer quoted above, like a combination of linear and non-linear structures, and strongly dislike a "*Completely linear approach*" (ID). Another respondent (S_OD, ID) dislikes "*Static 'one fits all courseware/page turners, Unstructured and disorienting UI-Design."* For this respondent, courseware should be neither completely linear, not be completely unstructured. Finally, some participants dislike linear approaches altogether, such as participant (A_OD) whose concern is *"Bland 'click through the links' style of courseware - followed by MCQ.* For this participant, there is a link between navigation and learner engagement with the courseware. The range of responses clearly indicates that participants' have potentially conflicting concerns regarding the navigational structure of courseware.

There is however agreement that courseware should be well structured. For instance, one participant (S_OD) requests a "*Well structured course with on-going assessment*." The problem however, is that there is no single definition of 'well-structured', so the ability to develop navigational guidelines regarding structure are difficult here. On the other hand, it may be that other aspects of interface design, such as screen design and layout, may provide a sense of structure. For example, one participant's concern is *"Lack of streamline format – Layout often differs in each category of courseware."* This will be investigated further in the next section. The fourth concern regards navigational tools. Generally, respondents like what one participant (S_E) calls *"User friendly navigation tools".* Many of these tools have been addressed already, such as help tools that aid wayfinding. There was one participant (A_E) however, that says "*The navigational tools can be annoying - however this is probably a trade off in the balance of what courseware can and cannot do".*

Unfortunately it is not clear which navigational tools are disliked. The researcher anticipates that more information regarding navigational tools will emerge within the next section.

(iv) User/Learner Control

There is a shared dislike amongst participants of courseware that prevents learners from controlling the functionality of the interface and embedded objects. For example, one participant (ID) dislikes "*Any automatic function that I can't control/turn off".* Most participants provide generic comments here, however a couple of participants are quite specific in regards to their requirements. For example, one another participant (ID) suggests that courseware should include a *"High degree of user control for feedback".* Another participant (A_E) would like to see "*The capacity for courseware to automatically display textual material at a user-selected reading age".* Both of these examples indicate a link between the interface design and learnability. The first example indicates that learners should have higher levels of control over the feedback, although it is not sure how this should be designed on a practical level. The second example indicates that learners' should have greater control over the interface, by preselecting a preferred reading age for the text-based font size.

(v) Inconvenience

The quantitative results demonstrate that respondents generally agree that courseware should utilise effective usability, such as clear navigation, good screen design, and help menus. The qualitative results support these finding, and provide a greater level of understanding in regards to specific usability features that are concerning. Like other aspects of user-friendly design, a high percentage of participants' had a complaint regarding the inconvenience of courseware. There is a very strong consensus that pop-ups, long downloads, and issues related to hyperlinks are inconvenient. Pop-ups refer to windows that automatically 'pop-up' when learners' navigate to specific webpages. These particularly frustrate learners, for instance one participant (S_OD) says dislikes *"Pop-ups-I automatically delete/cancel anything I haven't solicited".* Download time refers to the length of time it takes for the screen elements and learning objects to be viewable and/or usable. Respondents strongly dislike *"Slow loading pages and pages that does not load"* (S_OD). One respondent (A_E) is specific in regards to the length of time that is considered too slow: *"Long downloads e.g. beyond 2 minutes".* Another respondent (ID) correlates long download times to *"Webpages that are graphic rich, or use large sound files, and take ages to load".*

An emerging sub-theme has already addressed participants' – particularly learners', requirements for higher levels of graphic and multimedia-based content. The ability to deliver courseware that incorporates fast-loading multimedia design, show the importance of graphic and web development skills in delivering courseware. One participant's (S_OD) comment may provide a potential solution, they suggest for courseware to provide the "*Ability to run*

offline/save offline easily". Finally, participants' strongly dislike text and graphic-based icons that are difficult to see or does not work. For example, one participant (S_OD) dislikes *"Bad design (buttons not working, etc."* Another respondent (S_OD) complains about "*Hidden/unclear links" and "Very small icon links (especially printer links)*. Many participants express a concern regarding at least one of these three inconveniences. These concerns may be addressed by following standard usability guidelines within the design and development stage. The unique consequences of their omission however, is that it negatively affects learners' perception of teaching and learning online.

(vi) Technical Problems

User-friendly design also incorporates a consideration of the technical elements that may hamper usability. Nevertheless, these elements are sometimes underestimated within the project lifecycle. The qualitative data shows that participants are concerned by *"The technical things that can go awry"* (A_OD). These appear to particularly affect the ability to develop and deliver courseware effectively. There are three specific technical problems that concern participants. The first problem is *"If the systems is always down ie bad server"* (S_OD). This prevents learners' from logging into the courseware, and accessing required content. The second problem is that that the technical constraints, generally associated with learning management systems, prevent academics from implementing their design preferences effectively. For example, one academic (A_E) complains about the "*Inability to change page setup and remove/ move around items as needed*" as well as "*Inconsistencies in the way pages are setup".* Another academic (A_OD) complains, "*Drag and Drop is not available in Vista"* and comments *"More usability in terms of Vista required. More intuitive systems required."* The perceived difficulty in using standard development tools may influence academics' perception of courseware.

Finally, learners in particular, are anxious about compatibility issues across different operating systems. For instance, one student (S_OD) complains about the *"Lack of accessibility with all operating systems",* and would like courseware that is "*more compatible with all operating systems",* as "*I have a Mac at home and can't access WebCT due to too high system requirements"*. Another student (S_E) agrees that there should be *"Increased accessibility from home".* They comment that it is *"Often timely or sometimes not at all".* For these students, the type of operating system used significantly affects their ability to use learning management systems, and access their academic courseware. One participant (S_OD) provides a potential solutions, by noting *"The GUI should be very user friendly / customisable cross-platform (win xx, mac osx, unix, linux) essential".* As this student notes, courseware should be accessible across platforms, to ensure students have equal access to learning material. Otherwise, some off-campus students may be disadvantaged.

(vii) Accessibility

The penultimate sub-theme here is accessibility, and it has been addressed in some degree already. It ensures that the courseware is easy to access, and takes into account the limitations of the end-user and the equipment that they may be using. There are two specific features that are important to address here, which haven't yet been discussed in-depth. The nature of teaching and learning online is that participants' are required to spend some lengths of time in front of a computer. There is a shared concern amongst participants about the difficulty in reading text online, due to font sizes or bright screen colours. One respondent (ID) suggests *"Larger font sizes to ease screen reading problems"*. Another person (S_OD) suggests that courseware should include *"Adjustable font and screen colour".* For courseware that requires learners' to read off the screen, there is a clear link between usability and learnability here.

There is also a shared concern about what one participant (S_E) calls *"Downloads being compatible etc".* There is however some conflicting thoughts in regards to what participants perceive as compatible. Two of these are displayed below:

> *"Overuse of pdf files instead of doc files. While pdf is developing means for ease of editing printed/text info, it is still insufficient & not as accessible or easy to use as word etc" (S_OD).*
>
> *"All docs in pdf-not Word. All docs should open in a new window OR you should be able to use the back button from the browser. It is very frustrating when you have to close down and begin again to navigate the rest of the site. This happens a lot in WebCT and the library catalogue, eg.E-Reserve docs" (S_OD).*

The first student perceives PDF documents as being less accessible and easy to use as Word. The second student disagrees and believes that all documents should be in PDF, as opposed to Word. This indicates that courseware should ultimately provide multiple layers of accessibility in terms of download compatibility.

(viii) LMS

Learning Management Systems are eLearning software that facilitates the design, development and delivery of courseware. There is shared concern amongst participants about the user-friendliness of contemporary learning management systems. Some of these concerns have already been addressed. For instance, Learning Management Systems have been associated with limiting navigational functionality, as well as other design features such as 'drag and drop'. Given the number and scope of comments the researcher considered is worthwhile addressing the area of learning management systems separately. The main concern on Learning Management Systems is the perceived limitations on the interface and navigational design, particularly by students from Other Disciplines. For example one student (S_OD) complains about "*WebCT-like interfaces which are awkward to use".* Another student

(S_OD) complains about *"Bad navigation/interfaces"* and specifically dislikes *"Primitive navigation methods (such as current LMS Blackboard)".* Another student (S_OD) is more explicit and says "*I does not like how WebCT has an email section and notices alongside webmail. It makes it confusing as to where to look for information provided".* The quantitative results show that participants agree that screen design and layout affect usability, and this comment in particular, provides a tangible example of how this occurs in practice.

6.3. 1.5 Theme: Effective learning design: Requirements for learner-friendly design

The concept user-friendly applies across all areas of software design, and the same principle of making the design easy to use applies. The way in which it is applied on a practical level however, differs according to the medium. Whilst user-friendliness and 'usability' is important to courseware, learner-friendliness and 'learnability' is also essential. The concept learner-friendly is unique to courseware, as it brings in a pedagogical focus to the design. It integrates pedagogically oriented theory and practice that is aimed at enhancing the learning experience. As such, it necessitates a learner-centered methodology. The researcher has recognised however, that there continues to be some level of confusion and disagreement in both the literature and industry-based practice, regarding the features that enable effective learning. Nevertheless, there is a fast-growing literature base on the requirements of courseware design, which this research hopes to contribute towards. The qualitative data on learner-friendly design incorporated less than 40% of the overall feedback. It appears that participants', particularly students, are much more concerned with the user-friendly design of courseware, and more vocal in regards to how these features influenced their learning experience. Interestingly, the opinion of professionals often conflicted with those of other For instance, one web developer was against 'meaningless' interactive activities, whereas students in particular agree a high level of interaction is important for learner engagement. It is relevant to point out here that the following sub-theme focuses on learner-friendly divergence of opinions, as opposed to learner-friendly concerns. Under this theme, the following sub-themes emerged: Educational Philosophies/ Learning Styles, Resources, Self-Tests, Interactivity, Personalisation/Adaptability, and Feedback/Facilitation.

(i) Educational Philosophies/Learning Styles

The quantitative results showed that of all the occupational groups, instructional designers most strongly agree that courseware should be based on educational philosophies and principles. Within the qualitative feedback, this group was the most vocal about their belief, that the courseware should enable learning. For one participant there should be a match between the pedagogical model used, and their personal learning approach. This participant (ID) dislikes "*Applied pedagogical learning models that conflict with my personal learning approach".* Unfortunately, this professional did not explain what his personal learning approach is, or what pedagogical models conflicted with these. His colleague also supports

the requirement for courseware to enable effective learning, however he provides slightly more detail:

> *"The most important 'feature' of courseware is that its design enables effective learning. This involves clear-headed analysis of the learning objectives of the course and the learning needs as well as the learning styles of the students involved".*

For this instructional designer, three elements combine to enable effective learning: analysis of the learning objectives; analysis of the learning needs; and, analysis of the learning styles of students using the courseware. Nevertheless, it notable that this feedback instructs us on how to design effective courseware, as opposed to which educational philosophy (or philosophies) should be utilised to enable this. The qualitative data shows a strong consensus that courseware should accommodate different learning styles. As one participant (S_E) says, *"I would like to see a range of mixed modes to accommodate all different styles of learning".* When it comes to learning styles, the use of mixed-modes such as text, graphics, and sound may help target different abilities and preferences. Within the quantitative data students from Other Disciplines were less keen than academics and students from Education in regards to whether courseware should accommodate different learning styles, and utilise a range of mixed media. Within the qualitative data however, these students are the most vocal in regards to their requirement for mixed-media. They also express concerns regarding its implementation. In particular, there is a strong consensus that face-to-face lectures should be provided online.

When it comes to implementing this however, students would like a multimedia approach that incorporates both sound and visuals. For example one students would like to see *"Online movies of lectures → ie. not just sound, but slides too."* Another student agrees, and says "*I-Lectures → audio only is frustrating. Need visuals of the person who is speaking. Annoying".* For this participant eliminating the visual element is frustrating, and may negatively impact their experience and engagement with the courseware. Another student makes a direct connection between multimedia to address different learning styles. They comment *"Audio combined with lecture notes. Multimedia approach. Video better yet. Something that appeals to all learning styles".* On a final note, one academic's (S_OD) comment shows that they believe courseware restricts the ability to present information orally. One of their central concerns is the *"Lack of opportunity for oral presentation"* within courseware. So, whilst students are demanding video-based lectures online, this academic indicates that it is difficult to present oral-presentations via courseware.

(ii) Resources

The quantitative data showed that participants' strongly agree that courseware should provide useful resources for learning. The qualitative data shows that most participants strongly agree that courseware should include useful resources. Some participants, such as

this participant (S_OD) actually call for *"More resources"*. The qualitative data also provides further insight into the type of resource that is required, and issues relating to accessing those resources. Some useful resources participants would like to see include *"links to further information e.g. book review online has link to multimedia about that book*" (A_OD), "*Online web references and bibliography, Online glossary of terms and acronym"* (ID), and *"Recommended texts - what should be writing about"* (S_OD). There is a clear indication here that resources aid participants' learning experience. Furthermore, participants' believe that they should be provided with greater access to resources. For example, one participant (A_OD) dislikes "*Pay to view articles"*, as it prevents him from accessing helpful learning resources. Another participant (S_OD) says that *"Uni should subscribe to every psychology journal"*, and their only concern is that "*Every journal should be available".*

Participants' also indicate that there are some usability issues when it comes to accessing useful resources. One participant (S_OD) dislikes "*Hard to find readings"*, whereas another (S_OD) recommends "*One portal for resources".* Another student (S_OD) suggests that courseware should include the *"Option to link to extra information and/or examples with appropriate setup so that user does not have to keep switching screens".* This participant indicates 'extra information' should be accessible on a 'as needs' basis, as they find oscillating between multiple screens frustration. Finally, one participant (WD) complains about the:

> *"Duplication of text having material on a web page when there is a perfectly acceptable and more primary source available as a download documents or 3rd party online resource".*

For this developer, if information is accessible as a downloadable resource, it should be provided as a download as opposed to text-based content on the screen. There are a few potential issues here. Firstly, participants', such as the one above clearly indicate they'd prefer not to oscillate between screens. Secondly, the designer may have incorporated only specific elements of the document, for pedagogical reasons. Thirdly, the designer may have incorporated text-based content, for reasons of accessibility. Finally, if the downloadable resource was multimedia-based, the designer may have incorporated text-based content to address linguistically oriented learning styles. This comment tends to highlight a division between the requirements of the designer, with the opinion of the developer. It also tends to indicate that the web-developer is out-of-touch with the requirements of the designer. More research is required however, to confirm these implications.

(iii) Self-tests

Both the quantitative and qualitative data shows a consensus amongst participants' that courseware should include self-tests. More information in regards to their requirements on self-tests is provided here, particularly from students. There is agreement that self-tests

helps student learning. As one respondent (S_OD) says, "*I think self-tests would be extremely helpful to students in their studies".* Many participants' believe the strength of self-tests is that enables them to monitor their learning progress, particularly after they have covered specific units. For instance, one participant (S_OD) requires "*Self assessment after certain units, so I can access my learning and receive feedback".* There is a range of self-tests students' request, from multiple-choice tests, short-answer questions, to those that encourage problem-solving. For example, one participant (S_OD) likes *"Multiple-choice Questions",* a fellow students requests "*A lot of practice questions & online problem-solving",* and another student wants "*More self testing for students-in the form of Multiple-choice or short answer that provide feedback to students".* Whilst some participants' preference self-tests as effective forms of route learning, others believe they should enable students to construct meaning from the content. This will be addressed in more detail within the next section.

There is slight disagreement amongst students' in regards to the use of multiple-choice questions however, and this will be discussed in the next section. Relevant here, is the requirement for self-tests to provide timely feedback. For instance, one participant (S_OD) says "For Multiple-choice quizzes I would like to see the correct answers after submitting mine so I know where I've gone wrong and am learning rather than a pass/fail". This requirement applies for short-answer questions. For instance, a fellow respondent (S_OD) says "I would like some short answer questions on WebCT that would help/assist learning content of subjects with answers provided". Most feedback regarding self-tests comes from students from Other Disciplines, however a couple of academics from Other Disciplines provided relevant feedback. The first academic (A_OD) comments, "*Online revision tests, the Univ of Melbs Department of Chemistry's Chemical Labs are a fun, effective teaching tool*". The qualitative data included generic requirements for courseware to be 'fun' and 'engaging'. Most participants however failed to provide further information in regards to how this can be achieved. For this participant however, self-tests can be both fun, and pedagogically effective. The second academic (A_OD) provides a direct comment regarding the use of multiple-choice as a assessment tool. She comments, "No, the subject matter means it is not relevant". This lecturer believes that multiple-choice tests are not applicable to the teaching of English Literature.

(iv) Interactivity

There is a strong consensus amongst most participants' that courseware should be enable higher levels of interactivity. They would like to see more "*active learning environments" (*ID*),* where there is "*More opportunity for interactivity with the content"* (A_E)*.* Although there is a strong call for interactivity, participants' are generally less explicit in regards to the specific features of interactivity. One participant (S_E) requested *"Interactive browsing and quiz",* and

therefore aligned interactivity with navigation and activities/tests. Most comments however associate interactivity with activities/tests. For instance, one respondent (ID) requests "*Interactive activities that reinforce the learning*". Another participant (S_OD) comments *"More interactivity (MLIs are good)".* Meaningful Learning Interactions are online learning objects, such as 'drag and drop', 'click and reveal', and 'multiple-choice'. They are generally used to test lower order thinking skills, however if they're well-designed they may enable higher order thinking skills. In some cases, particularly within industry-based design, they are used to encourage higher levels of interactivity, for learners' covering contextual learning content. Whilst participants' agree that courseware should include higher levels of interactivity, one participant (WD) provided another perspective. This professional web developer would like to see:

> *"Meaningful interaction – concentrating a lot of development effort into one activity/game that helps students understand a key concept is more effective than activities for activities sake that add no more value than a well written article."*

This perspective tends to disagree with the requirements of most other participants', which call for higher levels of interactivity without necessarily enforcing a limitation on how these activities may be designed and implemented. An important issue here, is whether interactive activities help motivate learners, particularly when they're covering contextual learning content? Would learners' prefer to read a text-based article, or would they be more motivated within a learning object that presents the content in a more interactive manner? The qualitative research thus far tends to indicate a preference for the latter, however further investigation is required to enlighten us here.

(v) Personalisation/Adaptability

The qualitative data includes a range of apparently disparate learning design requirements, which the researcher has linked together under the sub-theme of personalisation/ adaptability. The teaching and learning component have already addressed a concern amongst participants' that courseware is impersonal. Interestingly here, many participants' provide suggestions that may encourage a more personal and welcoming learning environment. For example one participant (A_OD), whom we have already quoted says the "*site should 'welcoming' and articulately presented, e.g. good writing style, clear use of language, must use language well."* This person believes that language can help make a site more welcoming. Another participant (S_OD) suggests, "*Photos & photos of others participating",* whereas a fellow student (S_OD) suggests *"More humanistic/human pedagogical agents to direct instructional material".* Whilst participants agree that courseware should promote a friendlier environment, one participant (ID) disagrees with one of the ways in which this may be achieved. This designer expresses a dislike for "*media heavy meaningless videos welcoming students to the course and not much else".* Learners' have already expressed a requirement for more utilisation of videos to present lectures, and a

more humanistic approach to instructional guidance. Therefore, this comment tends to indicate that learners' would be opposed to this comment. Again, further investigation is required to establish students' perspectives in regards to 'welcoming videos'

The primary motive of personalisation is to enable the individual to feel comfortable within the teaching and learning environment. A secondary aim is to ensure that individual requirements of the learner are addressed. Despite the wide scope, students from Other Disciplines have provided a short but clear set of design requirements that are relevant here. This includes a "*List scheduled dates of assignments*", the "*Ability to run offline/save offline easily",* and *the "Portability of e-learning programs such as through mobile technologies."* The latter two comments indicate a desire for more mobile forms of learning. For another student, the design of courseware should map directly with any face-to-face coursework. They comment, "*The structure of the pages should be logically aligned with the teaching format of contents of the course. ie. by lectures, tutes, pracs or by subject breakdown".* This comment highlights the user-friendly requirement for more effective forms of information organisation.

Finally, three participants' express a desire for higher levels of adaptiveness within the learning design. Within an adaptable learning design, the learning sequence depends upon the needs of the learner. In other words, there is a more dynamic navigational path. The first participant's (S_OD) comments are ambiguous, as they comment "*More adaptiveness (goals, prior knowledge, learning styles)".* The other participants provide more in-depth information however. The first participant (A_E) would like to see:

> "*Reading router which depend upon user-proficiency (so if the student gets less than 50% on a mastery test they would be directed to a more detailed lesson sequence or even a remedial loop"*

For this respondent, courseware should be more adaptable to the needs of the learner, by directing them towards the most appropriate learning sequence depending on their skill level. For another participant (ID) courseware should provide multiple navigational options that also cater to the skill level of the students. The first option should provide more learner-direction "*'give me all the necessary info/tools/skills before presenting the task'*, whereas the second option should enable learners' to be more self-directed "*'just tell me the required outcome and I will require the required expertise on an as needs basis'".* The utilisation of adaptable learning environments may better cater to diverging learning requirements, as discussed in the next section.

(vi) Feedback / Facilitation

An emerging theme within this chapter has been the concern that participants' feel unsupported and isolated within the teaching and learning environment online. The

qualitative data provides further in regards to approaching this matter. It shows strong agreement amongst students that courseware should include a stronger presence of lecturers. There is a particular requirement for lecturers to develop a more collaborative relationship with the student via the online medium. For instance students from Education requests "*Replies from lecturer*", and *Also a reply to teacher link 2 ask questions or send feedback".* Other students wish for "*Easily facilitated feedback from academic → student", "Online forums. Feedback on assessments. Online tutor",* and *for "More easily accessible forums where educators participate actively".* These comments clearly show there is a strong desire amongst students for courseware to enable a stronger student-academic relationship, to support student learning. The comments also indicate a requirement for improved user-friendly design to facilitate discourse via the collaborative tools. The qualitative data shows that there is slight concern regarding the use of discussion boards amongst students. This will be discussed in the next section. Some students suggest that courseware should enable the "*Ability to chat to academic in real time".*

6.3.1.6 Theme: Effective learning design: Divergent Opinions

To reiterate a point made earlier, the concept of learner-friendly design is unique to courseware, as it brings in a pedagogical focus to the design. Also, although there is fast-growing literature base on teaching and learning online, there continues to be some level of confusion and disagreement in both the literature and industry-based practice, regarding the features that enable effective learning. This is mimicked to some degree, within this research. The purpose of this chapter however is to discover some of the perspectives behind these differences of opinion. Interestingly, this component of the research is particularly enlightening. This may be because there is the strongest divergence of opinions on this theme. For instance, the quantitative data showed that participants generally agree that learners' should be consulted in courseware development. In reply to this issue however, one academic from Other Disciplines, who had recently developed a mixed-mode courseware, disagrees because she believes that this is "*impossible in the real world, as we only meet learners' when they start the unit".* For this academic, the ability to design learner-centered courseware is hindered by logistical issues. Nevertheless, effective courseware design should involve ongoing and post-evaluation.

The learner-friendly design requirements are listed above, and provide further insight into some pre-existing themes, as well as presenting some emerging issues. Given the range of feedback on other sub-themes it is less easy to group these as either 'requirements' or 'concerns'. Therefore, the researcher has strayed from the convention established in this chapter, and grouped the remaining sub-themes as a divergence of opinions. The results show an emphasis upon participants' views of behaviourist and constructivist principles. The researcher decided not to label this theme under perspectives on 'behaviourist and

constructivist' methodologies, because not all the feedback related to these principles. Since these theories fall under the scope of learner-friendly design, their inclusion is relevant here. Again, it is anticipated that the data will provide further insight into the existing findings, discover some emerging themes, and present the researcher with issues that require further investigation. Under this theme, the following sub-themes emerged: Assessment, Learning Outcomes, Multiple-choice, Independent and Self Oriented, Direct Instructional Guidance, Lower Order Thinking Skills, Higher Order Thinking Skills, and Collaborative Learning.

(i) Assessment

The design of assessment is a particularly important issue within the qualitative data. There is a range of comments regarding assessment, each providing a different perspective. Participants would like to see on-going and formative assessment that includes effective feedback. For example, one participant (S_OD) requests a "*Well structured course with on-going assessment"*, whereas a fellow participant (S_OD) "*Feedback on assessments".* It is particularly important to participants that assessment is well-designed. For instructional designers, this means providing clear instructions and aligning objectives to the learning outcomes. These designers express a dislike "*Poor instructions or explanations especially about assessment*", and "*Assessment questions that do not match objectives".* Within constructivist-based learning methodologies, learners' co-construct the learning outcomes, and the assessment questions that achieve the outcomes. Thus, these designers tend to link well-designed assessment, to the traditional strategy of pre-defining learning outcomes and aligning the assessment to these outcomes.

Another instructional designers' conception of well-designed assessment however, is more evolutionary. This designer believes that formative assessment should be more meaningful, and includes a mix of peer-assessment exercises, short-answer questions, and multiple-choice questions. Alternatively, he points out that courseware should enable students' to construct meaning. He says:

> "*In multimedia or computer based training/education software, often little thought is given to making formative assessment meaningful apart from quizzes. The same thing applies to online learning delivery systems, such as WebCT. I'd like to see more work/effort spent on developing peer assessment exercises for formative assessment and, perhaps mixing this with short answer/MCQ quizzes. Or more web sites devotes to presenting learning artifacts (sic) which students can construct".*

Further insight from professionals, would help us understand why little thought is given to designing meaningful formative assessments within teaching and learning online. This feedback does indicate that although the theory of constructivist learning methodologies is well established within the literature, there is still some hesitation towards its application by designers. When it comes to the tools of assessment, participants' express concern

regarding the design of multiple-choice questions and this will be discussed below. Finally, three participants dislike the use of courseware to deliver assessment online. The first participant (S_OD) dislikes "*Online assessments with unstable internet connections."* The second participant (S_OD) dislikes "*Online tests"* as they believe it is "*easy to cheat".* Finally, the third participant (A_OD) worries about the "*Lack of identity proofs at assessment end".* The emerging motif here, is the perception that courseware may be an unreliable mode to deliver assessment. The first respondent links this to the perceived instability of the software and hardware. The other two respondents indicate a lack of knowledge, on the processes for preventing cheating, and ensuring identify-proofs. This may because these processes are unidentified, not applied for various reasons, or perceived as unimportant by the courseware facilitator.

(ii) Learning Outcomes

The qualitative data included a range of comments regarding learning outcomes. The majority of this feedback comes from professionals, which indicates that these groups are most passionate about this issue. Interestingly, the feedback supports the quantitative results, and helps enlighten us to some degree. The quantitative results found that instructional designers most strongly agreed that learners' should know precisely what the learning outcomes are. They were the only group however who weren't sure whether learners' should actively participant in co-constructing learning outcomes. The traditional role of instructional design has been to pre-define the learning objectives, and match the design of the course structure and assessment to these. The move towards a learner-centered curriculum involves a more flexible approach to the learning outcomes, and by implication a change in methodologies. It appears that this move tends to be problematic for current instructional designers.

The qualitative results show that instructional designers strongly believe that learning objectives should be clearly stated upfront, however they are unclear about whether learners' should be involved in developing these. For example, one designer expresses a requirement for "*Clearly stated objectives".* Another designer comments:

> "*The most important 'feature' of courseware is that its design enables effective learning. This involves clear-headed analysis of the learning objectives of the course and the learning needs as well as the learning styles of the students involved."*

This respondent indicates that the analysis of the learning objectives is an important element in enabling learning. They are unclear however, in regards to whether these should be pre-defined and/or created collaboratively. A fellow designer expresses a concern for "*Poorly organised 'information dumps' with no clear guidance or course objectives, little awareness of personal objectives […]".* This designer distinguishes between 'course objectives' and 'personal objectives', however it is difficult to deduce whether this refers to 'pre-defined' and

'open-ended' learning objectives. It is clear however, that there is a consensus amongst instructional designers that the learning outcomes be clear to students upfront. Further research is required in regards to their perspectives on co-collaborated learning outcomes.

There was one reply from a professional web developer, which disagrees with the perspectives of instructional designers. It also helps explain why this group was least keen in the statistical data, in regards to whether courseware should make the learning outcomes clear. This participant dislikes:

> "*Explicit mention of educational rationale within course content. Course content should not tell you about what it is trying to do – it should fulfil its intentions on its own merit"*

This comment indicates a potential dispute between these two professional groups. When it comes to learners' perspectives however, many have indicated a requirement for a strong level of instructional guidance, however they do not refer explicitly to the learning outcomes. One student (S_OD) however did make a direct reference, and would like to see a "*Combination of clear objectives and some freedom/elective component, rather than one or the other".* The results concerning instructional guidance below show that there is a divergence of opinions regarding whether courseware should encourage a self-directed or teacher-controlled learning environment. This student indicates that there may be a middle-ground solution, which includes a mix between pre-defined and co-collaborated learning outcomes. This perspective may help explain the quantitative results, where students agree that they should know precisely what the learning outcomes are, as well as being involved in co-constructing them.

(iii) Multiple-choice

Only one participant expressed an outright dislike for "Multiple-choice questions", however many participants expressed a concern about the way in which multiple-choice questions are designed. Although the quantitative data shows that participants generally agree that multiple-choice activities, which entail a right or wrong answer, are effective learning strategies, the qualitative data shows that is also agreement that these types of activities have their weaknesses. In particular, the feedback gives the impression that there is a strong dislike for behaviourist style questions that encourage recall and memorisation, and which do not allow students to provide a rationale for their answers. For instance, one student dislikes "*Narrow-focused questions or information that reflect the content producer's view".* Another student (S_OD) says "*I dislike online multiple-choice quizzes as learners are not able to give reason or explanation to their answers".* A professional (ID) is more explicit, and their comment below supports those of students. In particular, it expresses a concern for multiple-choice questions that discourage learners' from constructing their own interpretation of the content:

> *"Patronising comments. Wrong/Incorrect → rather 'you answered …, you need to review …'. MCQ are often shoe horned designed questions, which are poor simulations of knowledge/skills testing. They tend to have too great an emphasise on careful reading and interpretation"*

Participants' dislike feedback that is unclear, and which does not provide them with an adequate explanation of why their answers were incorrect. One participant (S_E) suggests *"For Multiple-choice quizzes I would like to see the correct answers after submitting mine so I know where i've gone wrong and am learning rather than a pass/fail".*

Whilst the comments above to tend criticise the design of multiple-choice for low level knowledge/skills testing, there were two comments from academics from Other Disciplines whom give the impression that multiple-choice is an effective tool for these types of well-structured problems. The first academic's feedback tends to indicate that they associate multiple-choice questions as a tool for 'drill and practice' learning, which are based on behaviourist principles. Their feedback gives implies that they support this type of methodology, depending on the type of learning required. They approve of:

> *"Courseware that is designed in such a way that alternative modes and teaching methods such as drill or practice or constructive learning or examples are provided to the learner in the most effective way in regard to the type of thing that must be learned. ie. exploratory learning and multiple-choice have their specific strengths in the learning process."*

The second comment stems from an English Literature academic, and is a reply to the question 'Well-designed multiple-choice can be an effective assessment tool'. She comments, "No, subject matter means it is not relevant". This comment implies a belief that multiple-choice tests are better suited to well-structured problem types, as opposed to those involving higher levels of problem-solving, such as critical and creative thinking. This perspective helps explain the quantitative data, where academics from Other Disciplines were one of the groups less keen on using multiple-choice for assessment.

(iv) Independent/Self-Oriented

Researchers in Education tend to link learner-centered methodologies with independent learning, where students are responsible for self-orienting their learning. This implies a flexible learning environment, where students control what they learn, and how they learn. The qualitative research indicates that there is a divergence of opinions on the role in independent learning within courseware. Interestingly, there appears to be notably different perspectives according participant's occupation. Some participants - particularly students, strongly support courseware that enables a high level of self-directed learning. For example, one student (S_E) wrote:

> *"I would like to see courseware cover more areas. Some things cater for only one learning type. This is not effective for some people. The more unstructured, fun, independent the better."*

Some participants - particularly instructional designers, express a pragmatic point of view, where self-directed learning is balanced with teacher-directed learning. For instance, one ID supports:

> *"A balanced approach to the use of navigation/direction/layout, ie not directions or instructions – is not good. The amount of 'guidance and flexibility' needs to be balanced to cater for all learners."*

Some participants – particularly academics from Other Disciplines, support a high level of teacher-guidance, and their feedback implies an aversion to its counterpart. One view expressed was that students should be encouraged to be independent learners only depending "on [the] cost of support" (A_OD). For this academic, the instructional design approach depends on the time/monetary cost of facilitating independent learning. Although the researcher finds this perspective worrying, it is clear that many academics are feeling pressure by that they believe is the time/cost consuming nature of eLearning. Another view is that students should not have a high level of control over what and how they learn, due to the complexity of the content. As an academic (OD) states:

> *"…[we] need to scaffold learners – should not provide all information upfront, otherwise cognitive overload. For example, some students want to read several weeks ahead, and cover content that should not be covered until the end of semester. I'm against this, as they need to be guided, due to the complex nature of the content."*

Some students disagreed with the comment above. For instance, one student (OD) dislikes "When lecturers does not put notes on WebCT" and suggests "That all subjects have nots/slides on WebCT at the start of semester so you can read ahead or catch up if a lecture is missed". These comments highlight the finding that participant's occupational background plays a strong role regarding their perspective of self-directed learning. On a final note, it is relevant to reinstate the above. That is, methodologies that support self-directed/independent learning tend to be associated with highly flexible designs. Here, learning sequences tend to be open-ended, so that learners may navigate wherever they wish, and cover the content at their own pace. Potential issues here is that it may not be clear what content learners have covered, and how that content is relevant to their learning goals. The qualitative data shows that many respondents agree that these issues are a concern. For instance, one participant (A_OD) dislikes "Those that are so flexible that it is difficult to understand if there is a learning sequence and to get any sense of learning gained i.e. no milestones". Another participant (S_OD) suggests, "A learning progress indicator could be motivating". These comments highlight the link between user-friendly and learner-friendly design. It is clear that

the interface design plays an important role here, in establishing a sense of structure for highly flexible learning environments.

(v) Direct Instructional Guidance

The sub-theme above discussed learner-centered environments, and how these tend to be linked with independent learning where the student controls the pace and direction of their learning. Its opposite is a teacher-centered environment, where the instructor has a higher level of control in directing what is learnt, and how it is learnt. Researchers in Education tend to link these environments with behaviourist approaches. Generally, the more control teacher's have in directing students, the more committed to behaviourism they are. The qualitative data shows a trajectory of opinions on the role of direct instructional guidance in courseware. Furthermore, the majority of the comments stem from students, which indicates this issue is a particular concern to learners in Higher Education. Comments from some students imply that they are committed to teacher-controlled environments. These students appear to be strategic learners, and prefer to satisfy teacher's goals as opposed to constructing their own. They're focused on establishing a cohesive record of pre-defined requirements for assessment, and directing their efforts to realising these. For instance, one student (S_OD) requests "*Break down of what the lecturer thinks is required for the assignment. Recommended texts – what [we] should be writing about."* A comment from one student (S_E) implies that it is the role of instructors to be both omniscient, and directive as they say, "*Some instructor sure hard to follow. Tutors and lec (sic) expect us to know all when they does not know themselves".*

Many students does not appear to be committed either way to learner-controlled or teacher-controlled approaches. Nevertheless, their feedback indicates that they are slightly more committed to teacher-centered approaches. For instance, they indicate that that direct instructional guidance within courseware is important. They also imply a link between poor guidance and low levels of engagement. For example, one student (S_E) expresses concern about "*Badly set out, unclear instructions"*, another (S_OD) requests that lecturers are *"Straight to the point when explaining a topic/issue"*, whereas another's (S_OD) only concern is "*When I can't understand what to do".* Other students would like to see more instructional guidance through clearer wayfinding and effective feedback. For instance one learner requests "*The answer for each tutorial questions (sic) and clear direction area for students to study".* There appears to be a strong link between user-friendly and learner-friendly design again. As the comment above emphasises, interface design plays an important role in orienting students towards relevant course components. Finally, a few students imply that they are slightly more committed to learner-centered approaches. As one student (S_E) says "*I dislike if its all instruction we need to learn through mistakes. Instruction goal needs to be*

individual learning also". Nevertheless, there were significantly more comments regarding the necessity of teacher-guidance, than those that tend to critique it.

(vi) Lower Order Thinking Skills

Lower order thinking skill tend to be associated with behaviourist approaches, such as 'drill and practice' instructional sequences, that encourage reinforcement and memorisation of pre-defined knowledge structures. They are also popularly associated with science-based subjects, in which knowledge is often well-defined. For instance, lower order thinking generally includes recalling information, comprehending this information through summary, and/or applying this information through classification. The emphasis is on reproducing knowledge, as opposed to dealing with it in more complex ways. The qualitative data produced some surprising results, mostly stemming from academics and students from Other Disciplines. Some participants, specifically academics from Other Disciplines, strongly believe that the course instructor should state and enforce their opinions about course content, as opposed to encouraging the learner to negotiate their own interpretation, and expressing other understandings.

As one participant (A_OD) says, it "*Depends on the subject, i.e. nursing ok, not relevant for English"*, whereas another (A_OD) also comments, "*Depends on subject matter. Some things in science are not open to debate until advanced studies"*. This respondent would like to see the "*Rendition of fundamental principles always available".* These comments indicate a belief that there is a role for lower order thinking, depending on the subject matter. They also give the impression that they are somewhat committed to a behaviourist mindset. That is, they support the notion that knowledge should be transmitted in some situations, as opposed to encouraging students to construct their own meanings. A comment from their peer however, indicates a more pragmatic perspective. They request:

> *"Courseware that is designed in such a way that alternative modes and teaching methods such as drill or practice or constructive learning or examples are provided to the learner in the most effective way in regard to the type of think (sic) that must be learned. ie. exploratory learning and multiple-choice have their specific strengths in the learning process".*

This academic supports the notion that there is a role for lower order thinking within courseware. They emphasise a process of learning however, where both behaviourist and constructivist-based designs are relevant at different stages. By implication, they support the role of 'drill and practice/multiple-choice' to address lower order thinking. However, they also support the role of 'constructive learning/examples/exploratory learning' to address more complex layers of though. Thus, they indicate that behaviourist and constructivist-based designs can complement each other within courseware.

Other participants, specifically some students from Other Disciplines, also give the impression that they are somewhat committed to a behaviourist mindset. There is agreement amongst a number of students, that courseware should include interactive activities that address lower order thinking skills. For example, one participants (S_OD) request, "*More graphics & interactive screens to reinforce learning content - more like online tutorials for computer programs"*, and "*Interactive activities/that reinforce the learning*. Not all students from Other Disciplines agree however, and critique the design of activities that address lower order thinking. For instance, some students are concerned about "*Narrow-focused questions or information that reflect the content producers view"* and *"Giving one answers without stimulating discussion".* These students express a strong dislike of criterion-referenced questions that reinforce the teacher's perspective. The data implies that they tend to support a constructivist mindset, in which knowledge is personally and socially constructed through meaning-making.

(vii) Higher Order Thinking Skills

Higher order thinking skills tend to be associated with constructivist approaches, such as 'Constructivist Learning Environments', which emphasise the facilitation of knowledge construction and problem-solving as opposed to knowledge transmission. They are popularly associated with ill-structured problems, which are complex and multi-faceted. Examples of, higher order thinking may include analysing difficult problems in-depth for a multitude of motifs/themes, reconstructing existing knowledge bases through meaning-making, and evaluating problems through reflection and collaboration as opposed to reproducing pre-existing answers. Increasingly, contemporary research in Education is disparaging of approaches than address lower order thinking. Instead, they encourage approaches that scaffold learners towards higher order thinking and deeper learning.

The qualitative data shows that there is a strong call for courseware to encourage higher order thinking skills. It also indicates that there is strong support for designs based on constructivist learning approaches. As one participant (S_E) comments *"I'd like a good learning environment that could be a type of collaborative learning problem-based learning and critical thinking. That would be really effective for knowledge creation."* Of all the student feedback, this one in particular, most strongly subscribes to a constructivist philosophy. For instance, in their dislike of courseware, their comment is "*Forget about teaching just focus on effective learning".* Constructivists emphasise the design of flexible 'learning environments', as opposed to 'teacher-centered instruction'. Here, learning is problem-based, and fosters deeper learning through higher order thinking.

It is necessary to point out, that much of the feedback here stemmed from students. They appear to be the most supportive and vocal here. There is agreement amongst students that

courseware should: include problem-based activities that are anchored in real-world situations and environments; present the complexity associated with these environments through a range of case-based examples; and, generally encourage collaborative learning (this will be discussed in more details below). For instance, in their requirement for courseware, some students (S_OD) comment "*Ones that allow me to be immersed in a problem (scenario based). A focus on enrichment (I want to feel the activity was worthwhile, I have learnt something", "Collaboration with other learners. Real world examples",* and *"More relevant examples related to topics".* Other students (S_E) request "*Ones that will help me as a fully qualified teacher → online learning objects etc",* "*More relevant examples related to topics", "More online examples and self testing", and* "*More hands on, what we are expected to do in the workforce rather than citing theory".* For these students, learning needs to be contextualised within real-world settings, to be both meaningful and engaging.

Whilst the crux of the feedback regarding higher order thinking stemmed from students, there were several comments by both academics from Education and professional Instructional Designers that are worth pointing out. When it comes to the former occupational group, there are two interesting comments that address the design of higher order thinking skills. As discussed above, designers of constructivist learning environments believe that these skills can be addressed, by contextualising learning within real-world settings. Here, information about a specific problem can be learnt within the context of that problem (see example in Chapter 4). One academic strongly supports this approach, and requests "*Local content being utilised as learning examples",* their peer however, believes that this design is "*Often impossible online".* This comment tends to indicate that this academic is inexperienced when it comes to the design of constructivist-based learning. Hence, the researcher speculates whether a lack eLearning design training, along with the perceived lack of institutional support discussed earlier in this chapter, contribute towards the development of courseware that may be pedagogically ineffective for learners. For instance, if academics are unsure of how to design for higher order thinking, then perhaps learners cannot achieve this via courseware.

It is relevant to reiterate here, that there is a growing literature base within a range of disciplines in Higher Education that emphasises the need for approaches embedded in a constructivist philosophy, which scaffolds learners' towards higher order thinking. When it comes to instructional designers there are a trajectory of perspectives, which tends to indicate a level of disagreement regarding the philosophical underpinnings of courseware. It was interesting to the researcher that this group had the most to say, when it came to the pedagogical design and its application within courseware. A few designers gave the impression that they subscribed to a behaviourist philosophy. One designer in particular, appeared to be committed to this approach. For example he requests, "*Clearly stated*

objectives. Interactive activities that reiterate the learning", and he dislikes "*No objectives. Assessment questions that do not match objectives".* This comment clearly indicated an alignment with a traditional instructional design approach. Here, the instructor predefines the objectives, matches the learning sequence accordingly, and designs activities and assessment that are criterion-referenced. In short, they are strongly teacher-centered, and a major criticism is that they address low-level skills at the expense of higher order thinking.

Several designers focused on the need for courseware to be learner-friendly. They tended to address the process of design however, and point out a vague requirement for courseware to enable 'learning'. Their feedback explicated a pragmatic approach. Hence, it was not unclear whether they subscribe to a particular educational philosophy, nor whether they believe courseware should foster higher order thinking. For instance, one designer commented:

> *"The most important 'feature' of courseware is that its design enables effective learning. This involves clear-headed analysis of the learning objectives of the course and the learning needs as well as the learning styles of students involved".*

There are a few designers whom appear to support constructivist a philosophy to learning. Approaches based on this philosophy emphasise the need for students to take control of their learning. Higher order thinking is fostered within these designs, because learning is goal oriented and emphasises problem-solving. Students are provided with a range of resources, a multiplicity of perspectives, and opportunities for collaboration. The emphasis is on knowledge construction, as opposed to knowledge reproduction.

Feedback from one designer clearly indicates an alignment with constructivist philosophy. He points out the need for formative assessment and/or courseware to focus on exercises that supports knowledge construction and meaning-making. In doing so, he implicitly critiques a traditional approach to assessment and promotes higher order thinking. He comments:

> *"In multimedia or computer based training/education software, often little thought is given to making formative assessment meaningful apart from quizzes. The same thing applies to online learning delivery systems, such as WebCT. I'd like to see more work/effort spent on developing peer assessment exercises for formative assessment and, perhaps mixing this with short answer/MCQ quizzes. Or more web sites devotes to presenting learning artifacts which students can construct"*

Finally, feedback from one designer indicates an equally strong alignment with a constructivist philosophy. He requests, *"Online web references and bibliography. Online glossary of terms and acronyms. Interactive exercises. Discussion questions based on real cases. Encourage student/student collaboration"*, and complains about *"Lack of study flexibility – instructor led".* This comment supports a requirement for higher order learning through a critical-thinking approach, where students can access a multiplicity of resources, immerse themselves in authentic cases, and collaborate with peers at their own pace.

(viii) Collaborative Learning/Facilitating Tools

There is a growing body of research in Education supporting the need for student-instructor and student-to-student (peer) collaboration to be facilitated for effective learning. Social constructivists in particular, believe that learning is primarily a social process, which necessitates a dialogue between participants for meaning-making and critical thinking. Other researchers believe that social networking is important for engaging students within a learning environment. Within courseware, collaboration can be facilitated online through a variety of means. The literature generally refers to discussion boards (asynchronous modes) and chartrooms (synchronous modes) however, despite there being a variety of ways to facilitate social learning for distance students. Of course, if the courseware is delivered by supplementary or blended mode, then one can assume that face-to-face collaboration is also possible. A lecturer/designer cannot assume that this is an option within fully-online courseware however, as learners' may be widely dispersed geographically.

As previously mentioned, the qualitative data shows that participants generally agree courseware should be more interactive, and incorporating online collaborative tools are one way to achieve this. Nevertheless, whilst some participants are very positive about the use of social networking online, overwhelmingly, many more expressed concerns regarding online collaboration, and some disagreed outright with the use of these tools. Furthermore, the feedback also shows that there are varying perspectives, according to participants' institution or occupation. These issues will be discussed below. Interestingly, participants from Higher Education are much more vocal about the importance of collaboration, and the use of collaborative e-tools. Overwhelmingly, students appear to be much more positive about online collaboration, and it is clear that these tools have an important role in directing learners, encouraging meaning-making through dialogue, and facilitating them towards deeper modes of learning.

For example, to requote a student (S_E), he comments, "*I'd like a good learning environment that could be a type of collaborative learning, problem based [environment]. That would be really effective for knowledge creation*". Other students would like for instance, "[a] Focus on collaboration" (S_E), "*Collaboration with other learners"* (S_OD)*, "Forums where class can share ideas and discussion"* (S_OD)*, "an area in which current articles can be posted that are relevant to the subject area"* (S_OD), "*More easily accessible forums where educators participate actively. A broader discussion of course related material (ie. not constrained to just the subject)"* (S_OD). The last comment indicates that collaborative learning can promote deeper understandings of the subject, which extends beyond that of surface and strategic approaches. Also, the request for stronger academic participation is indicative of a shared requirement amongst students, for academics to play a greater role online.

It is clear that students value academics' expertise, and require their feedback for direction and guidance. Generally, academics' perspectives of collaborative tools focused on pedagogical and time issues (as discussed below). Nevertheless, there were four comments that appear to support the role of academics in facilitating online learning. Three academics from Education expressed a liking for the *"Ability to talk with lecturers online via chat programs"*. This implies that some academics from Education tend to be more in touch with the needs of students, when it comes to the use of synchronous chat technology. Within both the quantitative and qualitative data students were the keenest, about their requirement for synchronous chat technology (as discussed below). One academic from Other Disciplines says "*I would like to see more […] opportunities to interact on-line with lecturers/tutors. Also, more opportunities to interact with other learners".* Whilst this academic supports the use of online technology for collaboration however, she also points out that it is necessary to maintain a face-to-face component. Again, this implies a level of synchronicity with the needs of students. The data shows that students extremely keen a face-to-face component to be maintained (as discussed below).

Occupation appears to play an important role when it comes to participants' requirements and concerns regarding collaborative leaning. The qualitative data shows that academics support collaborative learning for directing/ facilitating learners', and supporting a teacher-student and student-student relationship within their courses. Nevertheless, they are much more hesitant in their support of collaborating via online technology. The feedback indicates that academics perceive online collaboration as pedagogically ineffective, time consuming, and impersonal. For instance, one academic (A_OD) makes a comment in regards to their concern regarding collaborative learning and literacy. She comments, *"restricted discussion and feedback for those with learning difficulties/lower literacy levels (visual arts has 'non traditional early requirements therefore literacy and computer literacy a huge problem)".* She then points out that it is "*hugely time-consuming for teachers to produce, update and provide feedback at same level as for face-to-face teaching."*

This comment represents academic's concern that online collaboration cannot effectively address at-risk learners. These include students whom have lower levels of computer literacy, or whose second language is English. As one of her colleagues complains, "*Lack of immediacy of interaction. Difficult to identify students having real difficulties- interpersonal aspects"* (A_E). The comment also represents academics' concern regarding the perceived lack of synchronicity with online communication. Most academics agree that online courseware does not adequately enable interaction on the same levels as face-to-face discussion. As another colleague comments, *"need to find a program that duplicates/replicates face-to-face social interaction/phone interaction, i.e. so much information is lost from online interaction".* Finally, the comment further represents

academics' perception that online collaboration is time consuming. As another participant (A_E) complains, there is "*"Expectation (by students) that you'll answer emails instantly".*

Examining the feedback from academics, the researcher wonders whether academics clear lack of familiarity with synchronous and asynchronous technologies clouds their bias. As presented above, they desire collaborative methods that are not time consuming – especially in terms of providing feedback, and which are pedagogically effective – especially for at-risk students. Nevertheless, the researcher speculates that academics may be predisposed to dislike online collaboration, without a full understanding of the way asynchronous and synchronous technology can be incorporated within a teaching and learning environment, in both a time and pedagogically effective manner. For instance, academics tend to critique online learning, because of a perceived lack of synchronicity, a perception that online discussion can be restrictive, and the extra time associated with providing adequate feedback. They are clearly unfamiliar with the variety of synchronous software available, and how these can be used within a teaching and learning to collaborate with multiple learners.

Furthermore, the feedback also gives the impression that they do not have established guidelines when it comes to educating students on their availability online. For instance, it is procedure to provide students in face-to-face courses restricted days/times for when they may seek help from teachers out of class times. As one student (S_OD) comments, "*I like online chat, but often the chatrooms are empty. Perhaps there should be set time/date for lecturers to chat online with the lecturer or other students, that way we know somebody will be online".* Hence, it is evident to the researcher that similar restrictions should be applied online, and this appears to be supported by some students in the qualitative data. Thus whilst many lecturers supported collaborative learning for guiding and supporting student learning, they appear to be hesitant about the concept of online collaboration, and providing feedback to students this way.

The qualitative data shows that whilst there is some level of agreement between academics and students regarding collaborative learning, some issues posed by students are at-odds with those of academics. The data shows that students also support collaborative learning, however they were generally more concerned about developing a student-teacher relationship, than one with their peers within courseware. Whilst several students expressed their support of *"Collaborating with other students"* (S_OD), the feedback also indicated that a more pressing for students was for academics' to have a strong online presence for directing/facilitating student learning. We have just established that academics' may be biased against online learning, because they dislike the time it takes to provide adequate feedback online. Students on the other hand, tend to disagree. There is overwhelming agreement amongst this group that academics should have a much stronger online

presence, and be more active – particularly within discussion rooms. For example, students request "*Stronger lecturer presence" (S_OD), "More discussion input from lecturers"* (S_E), "*Discussion board. Replies from lecturer*" (S_E), and *"Online tutor"* (S_OD)*,* and *"More easily accessible forums, where educators participate actively"* (S_OD).

The feedback indicates that students appear to be more familiar with the capabilities of web based technologies than academics, and perhaps because of this, they tend to provide very specific feedback on the use asynchronous and synchronous tools. For example, one student (S_E) suggests that courseware should include "*a reply to teacher link 2 ask questions or send feedback*". Another student (S_E) suggests "*Focus on collaboration – "these students are looking at the same topic → would you like to chat to them?"* Both of these suggestions show how user-friendly design may aid collaboration within courseware. They are also a good example of how students are more familiar with the technology, and are demanding that they be integrated more intelligently to aid learning. Another instance of where students express their knowledge of technology, and that where they have different requirements regarding courseware is where one participant (S_E) requests the "*Opportunity for private communication amongst participants".* It may be that some participant feel more comfortable sharing their opinions and garnering help from other students, and may be scared to volunteer their opinion – particularly if they shy, or not-at-ease with the content.

Many students support the use of discussion boards for a range of reasons, from information sharing, direction, and the construction of a deeper understanding of the course content. Nevertheless, they also request increased accessibility/usability associated with discussion boards. As such, there is a clear link between user-friendly and learner-friendly design here. For example, one student (S_OD) requests "*Easy-to-access message boards",* whilst another student (S_OD) suggests "*Alerts – courseware should generate email alerts from certain discussion board posts, eg from lecturers if it is urgent".* This is an example of where technology can be integrated to aid learning. Not all students supported the use of discussion boards however. One student (S_OD) dislikes the reliance on discussion boards as sole means of information sharing. He dislikes, '*When information is provided in discussion forums but not anywhere else"*. A couple of students (S_E) disliked the use of discussion boards altogether, and their only concerns regarding courseware is *"discussion boards".*

Like academics however, the issue of synchronicity also appears to concern some students. For instance, one student (S_OD) complains about, "*Maybe not being able to ask questions immediately and get help – there may be a delay with the forums, etc."* Perhaps, justifiably, students were much keener on the use of chat technology. For instance, they request an "Online *chat module*" (S_OD), and support the "*Ability to chat to academic in real time*" (S_OD). It is clear that being able to communicate synchronously is very important.

Academics tend to point to face-to-face leaning, to address the perceived weakness associated with online communication. Whilst students strongly agree that a level of face-to-face contact should be maintained, they tend to be more creative when it comes to other ways in which collaboration can occur. For instance, one student (S_E) suggests "*Opportunities for asynchronous interaction with other participants but also allowing for face-to-face or otherwise phone contact".*

The quantitative feedback showed that whilst professionals agree important for learning, they were noticeably less keen on the use of discussion boards and chat than other participants. The qualitative data included two comments relating from instructional designers, and although they appear to support peer-collaboration, each provides different perspectives relating to online collaboration. The first instructional designer requested "*Discussion questions based on real cases. Encourage student-student collaboration".* This comment gives the impression that the respondent supports a social constructivist perspective, and believes discussion boards can be used to promote meaningful learning. Their peer disagrees, and dislikes:

> *"Over valuing (and lack of evidence) to support the need for 'online discussion boards/chat rooms'. There is a need for learner/peer collaboration, but the effectiveness of unguided/non-directed online discussions is questionable. The 'context' is the critical aspect here – when making online collaboration work. The cost of effective online collaboration (including extra preparation etc) versus standard face-to-face would be an interesting exercise".*

Much of the literature investigated by the researcher strongly supports the use of discussion boards and chat rooms within courseware. Furthermore, the qualitative data presented thus far shows that generally, students support the use of discussion boards – particularly for constructing meaningful learning, and strongly support the use of chat rooms. Nevertheless, it is evident however, that there is a strong call for more active participation from instructors in guiding learners, and providing adequate feedback. On the other hand, as discussed earlier, it is evident that some participants are strongly independent and self-directed. Furthermore, there has also been a request for students to be able to collaborate privately, without interference from an instructor. Hence, the comment indicates that this designer may be somewhat out of touch with the requirements of learners. There is however, a need for further research into the effectiveness of unguided discussion boards/chat rooms. Like academics, it appears that cost/time issues dominate this designer's perspective, and the researcher wonders whether this also creates a bias against the use of online collaboration.

6.3.2 Courseware Evaluation

6.3.2.1 Introduction

The results of the open-ended questionnaire component have just been presented. The grounded theory methodology discovered that there were a range of requirements and concerns, regarding teaching and learning online and user-friendly courseware design, and both requirements and a divergence of opinions on learner-friendly courseware design. The data showed that participants' perspectives frequently differed according to their occupation. Thus, whilst the researcher attempted to include only the most notable issues and differences here, she found that there were more than initially planned. The results of the courseware evaluation will now be discussed below. It is important to reiterate our discussion previously in this chapter. That is, the majority of the feedback stems from face-to-face interviewees. These participants were asked to go through the courseware prior to the interview, however the researcher also took approximately fifteen minutes to walk through the courseware face-to-face prior to the interview. These participants' will be individually referred to as 'Participant_1', 'Participant_2', and so on. Their primary occupational details will be indicated within parentheses, following on the tradition established so far.

Further details may include 'ESL', which represents those students for whom English is a Second Language. For instance 'Participant_1 (A_E)' is an academic of Education, whereas 'Participant_4 (S_E, ESL)' is a student of Education, for whom English is her second language. In order to broaden the research's perspective, other participants were invited to provide feedback via a range of educational technology listservs. These include one local (Tas-IT), one two international-based (IFETS, ITFORUM) listservs. These respondents provided were asked to provide feedback on any aspect of the user-friendly or learner-friendly design, via email or the courseware's Guest Book. A Splash page introduced them to some relevant design notes that contextualised the courseware - the researcher discussed these comments with interviewees face-to-face. The researcher received seven individual comments/feedback from students, academics, and professional instructional designers both locally and internationally. These participants will be referred to as 'Web' participants, however the convention established above will then follow. In additional parentheses however, will be the participants' location. For instance 'Web_Participant_2 (S_E, ESL, Canada), refers to a web-based participant, studying Education, whose second language is English, and whom is located in Canada.

6.3.2.2 Defining Courseware from the Participants Perspective

Prior to discussing the courseware prototype, face-to-face interview participants were asked what courseware meant to them. Although a definition was included in the prototype, the

feedback showed that participants did not necessarily adhere to this definition. The relatively slow integration of online learning into Higher Education is reflected in the fact that a couple of participants appeared to be somewhat unfamiliar with courseware. Their comments, as shown below, are enlightening. They indicate that courseware is still a 'new approach' within Higher Education, that it is something delivered 'as part' of a course as opposed to 'fully-online', that it is technology-based however it is not necessarily confined to the Internet:

> *"It is just something I know we're talking about a lot of more here, because it is the next direction we're taking. So we have to think about different ways of teaching our students"* (Participant_2 (A_E))
>
> *"Well, before I read your definition I wasn't one hundred per cent sure, I would have thought like things you can get on a dvd or whatever might be courseware. You know, you get part of a course you get this thing that somehow you've got to interact with. So this is obviously courseware, because it is part of a course and you're interacting with it"* (Participant_5 (S_E))

The unifying theme amongst the replies is the belief that courseware should provide digital resources to help students learn a particular subject. There are however, a trajectory of opinions on what this means in practice, particularly on the issues of 'pre-design', 'interaction', and 'collaboration'.

Some participants believe that courseware should be more than 'information dumps' which simply provide resources for learning. For instance, Participant_3 (A_OD) comments, "*I wouldn't consider notes online (to be courseware), more a package which you've been following and can do most of the learning*", and Participant_4 (S_E) comments, "*I think it is more than that, because courseware can be very broad. Not just 'tags' and, you can get a lot of information from courseware I think".* These participants see courseware as something that is pre-designed, interactive, and based on an instructional methodology, where much of the learning can take place. When it comes to the instructional methodology, students from Other Disciplines give the impression that courseware should be strongly teacher-centered, where the teacher controls the objectives, content, and results. For instance, they comment:

> "*I believe the term courseware means, the information relative to the course itself provided by the teacher or lecturer so it would go through a whole series of criteria which are various stages through out the course and they probably have sub-criteria under them." (Participant_8 (S_OD))*
>
> *"Courseware means software, and it will help a student to learning online properly, and teacher will also control the information. In other words, they control the result"* (Participant_10 (S_OD, ESL))

Students from Education however, are less focused on whether courseware should be teacher-centered or learner-centered. One student from Education points out the complexities in designing courseware for learning, and refers to Vygotsky's Zone of Proximal

Development. He believes that whilst courseware should be structured around learner-centered strategies - getting learners to manage their own 'progression', the challenge is to cater to individual differences. He comments:

> *"Well just, to me it just usually means an online set of files that people can navigate and work with […] Oh, I would assume interaction. Um, so it is basically pre-designed based on what instruction would be helpful to present the content and enable to users to manage their own progress through the course at a reasonable pace, So there are issues there about the size of the steps involved […] Well, this think is a structured creation, the extent to which it is hard wired is another ball game. Obviously, to be successful the steps need to be within the zone of proximal development. Um, and that's an enormous challenge for any courseware designer because the more open-ended the courseware is, the more difficult it is going to be to anticipate what that zone of proximal development is going to be"*

Vygotsky's theory on the one of Proximal Development points out that learners' need to be scaffolded through a process of teacher-guidance and facilitation, towards becoming independent and able to self-direct their own learning. As such, a strong student-teacher relationship needs to be available within the teaching and learning environment. Interestingly, every student pointed out the need for courseware to enable student-teacher collaboration. As Participant_8 (S_OD) points out "*there would need to be some level of contact, even if it was simply just to explain that and to provide additional feedback and information throughout it".*

On the other hand, when it comes to student-student collaboration however, students offer differing perspectives. When students explicated the need for student-teacher collaboration, the researcher asked them whether courseware should necessarily enable student-student collaboration via the use of email, discussion boards, or chat for example. Their feedback showed that for some students this wasn't something they required or expected from courseware. For instance, they replied, "*No" (*Paticipant_7 (S_E)), *"I wouldn't necessarily say that"* (Participant_8 (S_OD)), and "*Not students, but staff yes. Probably not verbally, like live stuff, but yeah"* (Participant_9 (S_OD)). Other students disagree, and believe that facilitating peer collaboration is essential for courseware. For instance Participant_4 (S_E) comments *"Yeah, yeah, very much so"*, when asked whether she expects courseware to enable peer-collaboration. The then comments:

> "*I think it would be good if you can have that, because uh, people like discussion board or whatever, for it is quite common and normal for students to study the same course during uni, but we does not have much time to meet, so that would be the place we meet".*

Students generally agree that courseware should include activities, and a couple of students in particular indicate that games based can be motivate and engage students online. For

instance, Participant_10 (S_OD) believes that activities are preferable to asynchronous collaborative tools, because of their perceived synchronicity in providing instant feedback. He pointed out that courseware should include interactive features. The researcher asked him to extrapolate on this answer, for instance does this mean 'email, discussion boards, activities'? The student replied:

> *"In my opinion I think the activities will be better, because everyone will be on the Internet. If there is email, maybe it will be slow, but if everyone participates in the activities it will be better and they will have fun."*

Whilst some participants think that courseware should be more than 'notes on a page', others offered a more pragmatic and open-ended perspective. They believe that courseware may a myriad of things, as long as it supports teaching and learning in some way. They believe that it is not necessarily pre-designed, and that it doesn't necessarily include interactive activities, collaboration with other learners, or contact with the lecture. For instance, one Participant_1 (A_E) defines courseware in a 'very general sense'. It could be 'notes on a page' however he believes higher quality courseware should include student-lecturer and peer-peer interaction:

> *"I think any materials that a student might have access to in order to facilitate their learning, and I generally think about courseware in a very general sense, so it could be a stack of photographs or a set of microscope slides, a textbook, or it could be an online course […] my feelings, the involvement of interaction is a higher quality piece of software, it doesn't necessarily involve interaction, but good quality courseware should".*

In another example, the researcher asked Participant 6 (S_E) whether courseware is 'necessarily supplementary, just notes on the page, an entire course, or interactive'? Her reply indicates a belief that courseware can be 'any of those things'. She comments:

> *"I think it can be any of those things perhaps. I take a preference to something that is partly face-to-face; because that's the way I like to work. But I imagine there would be people who wouldn't necessarily like that. So um, for example with a course here, I think it would be a down value to make it all eLearning type stuff, all courseware, but then I notice that the flexibility might suit a lot of people. People with young children at home, or people who are working or, you know, flexibility is probably really important to a lot of people".*

This participant deals with the concept of 'fully-online' courseware, and although she recognises that it can cater for people whom need a high level of flexibility, she also points out that face-to-face learning is essential for her as a learner. In discussing what courseware means, a couple of students also explicate a desire for a level of face-to-face contact to be maintained. They believe face-to-face element of 'social networking' is essential for maintaining their motivation, and that it provides a supportive framework for building a 'community of learners' where information is shared and discussed.

6.3.2.3 Aspects of the User-Friendly Courseware Design

In the face-to-face interviews participants were asked four open-ended questions on the courseware's 'user-friendly design', the use of 'usability aids', the 'visual design', and the provision of a multimedia mix of text/audio/graphics to welcome students to the site and deliver basic course content. The initial intention of the researcher was to outline the feedback for each of the questions linearly, however this proved to be problematic. Upon analysing the interview data, it became apparent that the data is best described as a 'matrix', where there is a high level of interactivity between each of the questions. Then turning to the feedback from web-based participants, she found that much surrounded the user-friendly design. Excluding on instructional designer, the user-friendly design appeared to be the courseware's strength for this web-based group. For instance, Web_Participant_4 (A_E, Australia) comments:

> *"I think it is user friendly and the icons are clearly linked to the content. It is also colourful and non-threatening to a first time user. The language is well explained, particularly 'jargon' […] I wish three were more courses like this online and then more people would be encouraged to use them".*

Likewise, the initial response from the range of participants is that the courseware is relatively user-friendly. Nevertheless, it is difficult to divide the feedback into perceived 'strengths' and 'weaknesses', because the discussion of nearly every component necessitated a trajectory of opinions. For instance, the data showed that many participants found the courseware to be user-friendly, because of specific tools such as: the 'First Time Use Tutorial'; the delivery of content by 'Video' platform; the provision of user/learner control of the navigation and content; the flexibility enabled by the accessibility options; and, the provision of collaborative tools. Nevertheless, each of these components brings with it a range of perspectives, and at times, disagreement between participants.

Thus, the researcher would like to present the findings below, dominated by those components that introduced the most discussion. In light of this, she would also like to point out the motif linking the concepts of user-friendly and learner-friendly design strengthens further in this section. That is, the interviewees show how the context of learning affects their approach in evaluating the courseware. Every participant approached the evaluation of the user-friendly design not from the primary perspective of 'user', but rather to that of the 'learner'. This provided some interesting results, as because whilst academics and professionals attempted to 'put their hat on' as learners, some of them also admitted their difficulty in doing this. As such, they approached from the additional perspective of 'teacher/designer'. Whilst their feedback in this section generally conforms to students, there a few times when they disagree, and other times when they express hesitation because of preconceptions on the need for innovative design concepts to be quantified in terms of the

value they would get in implementing them as teachers. When asked whether the courseware was 'user-friendly', most interviewees provided in-depth examples of how the user-friendly design impacts on their ability and motivation to learn online. Several participants' provided examples relating to the 'learner-friendly design'. This may be because these issues were in the forefront of their minds however the researcher would tend to argue that this is an example of how the concepts of 'user-friendly' and 'learner-friendly' design are interchangeable within courseware. The section below discusses some relevant feedback from the first four questions, according to: Screen Design and Layout; Aesthetics; Navigation; Collaborative Tools; Usability Aids; Learnability Aids; and, Evaluation.

(i) Screen Design and Layout

The qualitative feedback shows that the courseware's screen design and layout plays a strong role in both aiding and inhibiting the usability of the courseware. For many participants, this aspect of the courseware design appears to be the most important: it has the ability to motivate and engage through aesthetics; it has the power to cognitively overload and frustrate; and, it can provide a sense of structure in terms of the site's navigational options. The four most frequently discussed aspects of the courseware's basic screen design and layout include the: Splash Page; Homepage's Layout; Visual Consistency; and, the Multimedia Box. The courseware's Splash Page provides an entry point into the courseware, and it includes graphical 'click' buttons, which 'reveal' basic text About the Courseware, about The Designer, important Design Notes, and the Username/Password for guests. Participants indicate that the simplicity of the Splash Page induced a feeling of well being, and encouraged them to feel initially 'at-ease' with the online environment. For instance, Participant_1 (A_E) comments *"I very much liked the design of that page, very simple, it made you feel good when you came in, it did not baffle me".* When they navigated to the Homepage however, this turned to a feeling of being overwhelmed, confused, and visually/cognitively overloaded.

The Homepage is essentially a placeholder for participants to access the site's contents, either directly or via pre-designed navigational routes. In attempting to provide a convenient 'access-point' to the courseware's usability and learning aids however, the design actually resulting in confusing most participants. The general feeling was that the design of the Homepage was perhaps slightly clumsy, included too many menus, and poorly constructed visual elements that detract the eye from areas of prominence. For instance, participants comment:

> "*I think um, this is where I found some of the complications came in because your basic screen design is rather busy, and I think things that need to be prominent perhaps should be more prominent, and not too perhaps, overwhelming" (*Participant_1 (A_E))

> "*When you first look at that particular Homepage, you think where does the eye go initially, where do I start? In fact to that problem, there are a lot of different things to do, and nothing sort of jumps out so you think this is where I start reading, or I scan the page and click here"* (Participant_3 (A_OD)).

Participants generally contribute problems with the Homepage's to the graphical design and layout of the menu bars, and the multimedia box. The courseware appropriated traditional web heuristics when it came to the layout, and particularly the design of the navigational options. There were four menu bars, and each included items grouped according to their relationship with proximal sub-groupings. The main content menu located horizontal top is a drop down menu however the other items were located within navigational bars. Colour was used as an additional means to highlight the groupings of each menu. Mouseover buttons were used for each menu-item, however the content menu (located horizontal top) included drop-down items. The rationale behind groupings were to: clearly indicate the main areas of the course content, and indicate the sub-content (top menu); aid the way in this content may be accessed (right hand menu); assist collaborative learning by providing conveniently located buttons (bottom menu); and, generally provide an intuitive interface for navigating the courseware.

The qualitative data indicated that the researcher's intention to aid the site's usability might be impeded for some participants, by the way in which she has followed conventional heuristics. Generally, participants' feel that the range of menu options on the Homepage is overwhelming, and potentially distracting. They feel that that the Homepage should act as a site map, in terms of indicating to learners 'where they are', and 'where they can go'. It is clear however courseware doesn't necessarily succeed in fulfilling the latter objective. The menu bars designed to aid accessibility and convenience appears to cognitively overload participants', and prevent them from becoming fully aware of the courseware's contents and navigational capabilities. For instance, one participant comments:

> "*I'm faced with four menus, and I've got the one in the top right menu which is the home icon, and that's obviously an important menu to have around. I've then got the top bar – course information through to resources, I've then got the bottom menu, which is my profile through to exit, that's the third menu, and I've got items on the right hand side. And that looks a bit busy so I'm ignoring that side. But the fact that I've got four separate menus apart from the key items caused me distress […] we could talk about cognitive overload of course, because when I encounter this for the first time I have to read each item separately. Um, and they does not fade into the background*" (Participant_1 (A_E)).

Whilst the general agreement amongst participants is that there are too many menu bars, there is a range of opinions on how this should be fixed. Of all the menu bars, the one located to the right of the page created the most discussion. It was designed to act as a

toolbar to improve the way frequently used content may be accessed. It included a Search bar, links to the various courseware Messages, links to Course News, and Quicklinks to the course Timetable, Assignments, and Downloads. Some people were happy to ignore this menu bar, others found it distracting, and finally some found it helpful. For instance, Participant_1 (A_E) suggests that the courseware incorporate three of the menu bars top right, leaving the menu bar on the right because it is easy to ignore: "*And I would have this one on the right hand side, which I'd already been happy to ignore"*. Participant_6 (S_E) is somewhat undecided about the existence of the right-hand toolbar. She points out that that the options act as convenient 'shortcuts' - which she likes, however she also believes others might find this redundant:

> *"Um, yeah, I does not know sometimes things that are sitting right there though, are better than having to go through the menu. So, yeah, some people might think it is redundant but other people might think it is not inconvenient, it is like having shortcuts on your desktop. You know, they're there and you know how to get to them without having to drop down your things […] Personally I does not think it would matter to have an extra link to something, although it might be inconvenient to some people".* (Participant_6 (S_E))

There is also some level of disagreement when it comes to the drop-down menu options. Some participants' believe this will be popular option amongst students, and others found this to be a simple and effective way of indicating sub-groupings. For instance, when it came to their perception of the site's usability, Participant_5 (S, E) believes that the drop-down menus will be most effective here. He comments, "*Uh, I think the drop down menus is what they're going to use*". Participant_2 (A_E) goes further, and says:

> *"there wasn't too much information … everything seemed to work in a sequential sort of way, and even when you pull down menus, you can see how the things beneath the menu relate to each other, which I liked […] they were simple, there wasn't too much information in them, you limit the number of things in each one" (Participant_2 (A_E)).*

Not all participants agreed however, and found that the drop-down menus heightened their sense of feeling overwhelmed by the site's options. Participant_1 (A_E) comments, *"I can understand the grouping, that's fine [….] the fact as I moused over some of the menu items I saw that they revealed more things behind it, which added to my anxiety".* The interface and menu design were created to act as 'prompts' of the courseware's content and capabilities. Unfortunately, the execution of this appears to distract participants, and impede upon the site's usability. It is clear that a redesign of the Homepage's menu options would be required if the prototype were to be implemented within a real-world situation, and that a supplementary evaluation of the re-designed prototype should take place.

The central region of the Homepage was divided into two sections, each comprising equal areas of the main screen area. The left of the screen included the Start Tips icon, and adjoining this was the welcome message. This included text that instructed participants to play the video located directly below. The Download box was located to the right of the screen. It was designed to enable participants to download the same content in a variety of formats, and extend the flexibility of their learning. The top row of the box instructed participants to "*Click the buttons to download content in a usable format to your computer"*. The middle beneath this included the icons representing the download type. The bottom row included the text description of the icon: video; mp3 audio; ipod audio; html text; word text; and, pdf text. The inclusion of the multimedia options generated a lot of discussion amongst participants, many participants regarded the inclusion of this multimedia option as a strength of the courseware, and this will be discussed in more detail later. In brief, the main strength of this option appears to be the flexibility it provides learners, particularly when it comes to accessibility issues. For instance, Participant_8 (S_OD) points out that the courseware's strength is that "*it gives you a lot of different options. If you're not comfortable with one, you can sort of move on to one that you are more comfortable with*". Another respondent points out the aspects of the she likes:

> *"The constant emphasis on the flexibility of the media is also essential, as it increases accessibility for students, regardless of the type of equipment or Internet connection they use. Everything can be printed, everything is available on CD-Rom. This is so "in synch" with reality […] <<Lectures available via text, video and audio>> to <<help students with poorer English skills understand the content and improve their reading and writing abilities through example>> therefore reducing the demands of learning with a second language"* (Web_Participant_2 (S_E))

Whilst participants like the accessibility and pedagogical strengths of the multimedia options, they were concerned about the execution of its graphical design and layout. Nearly every interview participant expressed a comment about the prominence of the download box on the screen. Nevertheless, they weren't entirely sure whether a reduction in size would be beneficial. For instance, participants' comment:

> *"[…] the navigation and the download buttons are quite prominent there, and that depends, I suppose that's quite a good thing in some ways, but then it probably takes up some of the space where you could have a bigger video maybe, or um…But then if your purpose online is to download something well, then it is fairly obvious to, so i does not know […] Well, it is very clear what the things are, which is good if you, I know you've said it is not for vision impaired people, but you know it is not only for vision impaired people, it is people who are a bit dithery and get lost easy too. So maybe the prominence is good for them, i does not know. It does take over that section a little bit, the downloads section. But then, it is clear" (Participant_6 (S_E))*

> *"I thought that that (the options on the right) is very dominant, but then I thought if it wasn't dominant then would you see it? You might actually totally miss it, if it wasn't dominant. But if you're feeling like you want to print it out then you're looking around for where to do it, and you can't find it that could be an immediate sort of frustration"* (Participant_2 (A_E))

An analysis of the qualitative data shows that the prominence of the multimedia box detract the eye, and contribute to participants feeling somewhat confused as to what to do. Potentially, it also confuses participants from being able to use the options effectively. The general impression is that the range of options provided to the learners can be overwhelming, and that a redesign of the graphics, layout and functionality are necessary. Participant_8 (S_OD) suggests that the courseware set a default option for the download "*Just so, people does not get a little bit anxious 'should I be choosing this one, it is better than this one, sort of thing*". Whilst the First Time Tutorial instructed learners' that the download box is the 'same content in different modes', most participants scanned this content, and were unaware of this. Unfortunately, the interface design and instructions on the Homepage did not enlighten them. For instance, Participant_3 (A_OD) says:

> *"I think the idea, having those different models is good for someone who doesn't want to watch a video then they can just read the text. When I look at things like that, there's a mixture of types of icons, I does not know what would I do with those. If I came to this for the first time I might think 'mmm, if this text says download', mmm".*

He points out that it is not clear that the 'same content in different modes' is provided, because of the range of icons that all look different. He (and other participants) suggests that the problem lies in the fact that the alternative mode of download receives too much prominence, and that the video, which is the important screen element, doesn't receive enough. Thus, the researcher's attempt to follow conventional heuristic of 'balancing' screen elements for aesthetics appears to have a negative impact on usability in this context. Hence, the feedback indicates that the courseware should centre the video on the screen as the default option. It should also make the alternative download options available as generic text buttons that indicate their purpose. That is, as Participant_3 (A_OD) suggests, "*maybe you just need a thing that says 'download me as video, text'".* A redesign of the prototype and post-evaluation would be able to indicate further whether this reduces participants feeling of being overwhelmed by choice.

(ii) Aesthetics

The courseware purposefully utilised a bold, and colourful 'non-conventional' aesthetic combinations, generally associated with websites aimed at children. She found the combinations to be visually pleasing, and aimed to create an impression of 'fun'. Specific colour combinations were used for the basic menu-items, to indicate their groupings, and emphasise the different wayfinding and navigational options. Most of the extraneous

graphics were clip-art, however a few were mocked-up by the researcher using Photoshop. Interestingly, the aesthetics of the courseware created a high level of controversy. Only one respondent, Web-Participant_7 (ID) had a strongly negative opinion of the courseware's aesthetics. He commented, "*The colors and lack of professionalism are jarring. One of the elements of good implementation is knowing when and who to augment your team with. You need a graphic designer".* Four points can be drawn from this participant's feedback: firstly, the perceived negative impact on the non-conventional colour-combinations; secondly, the potential that the use of colour may impede upon usability; thirdly, that the graphic design needs improvement; and fourthly, and a perceived level of professionalism is required for effective online learning. The researcher would like to address all four of these issues in light of the feedback she received from other participants.

Overwhelmingly, the feedback indicates that one of the courseware's strengths is its bold use of colour. Most participants expressed satisfaction with the use of colour, and felt 'at-ease' with the colour-combinations used. For instance, Participant_2 (A_E) says in describing his first impression of the user-friendly aspects of the courseware, "*I noticed colour and layout things that were pleasing to me […] they're not offensive colours either. You've used fairly soft colours and they're complementary colours".* Several participants link the use of colour with learner engagement online. They expressed enjoyment of the positive karma produced by the 'fun' use of colour:

> *"I do like, um, they're happy colours, they're bright and they're cheerful which holds your attention. If it was all really dull you'd think 'oh, look i'm going through a dictionary sort of thing' and it is not very motivating. And in that regard, it is very good. Um, i'm just trying to think. Sometimes, the contrasts is a little bit light on, such as the white on the green are perhaps less easy to read than obviously the white on the blue, and pink and white is not too bad, but then when you get an orange and blue and things, it is a bit harder to read. I've got pretty good eyesight, but other people may not be as good. I think just more contrast it what it needs." (Participant_8 (S_OD)*

Despite the generally positive feedback therefore, further development is required on the prototype to alleviate reading problems associated with the contrasts of some colour-combinations. In contrast to other participants, particularly students, Participant_3 (A_OD) questioned the use of colour. He comments, "*you've got a lot of strong colours on some screens, which gives the impression of being more playful and less serious than i'd expect for this type of courseware".* When asked whether that is distracting, he points out:

> "Well, you'd need to talk to a twenty year old. For me, my students are doing web design, and we try and get a sort of thing that gives the right personality. To me it comes across as a bit off-putting than a lot of colours, but that's personal choice"

To this participant, the range of colours impedes upon usability, because it distracts learners' from focusing on 'where to go'. As indicated previously, participants' already expressed a

feeling of being overwhelmed ‘by choice’ when it came to the Homepage. It is possible that the ‘use of colour’ in line with the ‘open-ended’ choices on the Homepage, visually overload participants and contribute to a sense of cognitive overload. The qualitative data does indicate that the visual data outweighs text-based instructions. For instance, despite the text-based instructions within the First Time Tutorial and Homepage, many participants confused as to the capabilities of the courseware. Furthermore, most participants agree that text-based instructions are generally redundant if they supported well-designed graphical icons.

Unfortunately, many participants agreed that the courseware required better-designed graphics. Some participants pointed to the logo, which the researcher had included a range of ‘international students’ to incorporate a ‘personal look and feel’. Most participants believed that the logo needed to be redesigned in line with a more professional ‘look and feel’. One participant found that personalisation of the graphic to be off-putting, because the students ’*did not mean anything to her’.* There was also agreement that the Start Tips icon needed to be redesigned, as it ‘*did not look like a button’* so they *‘did not see it’/’did not realise it was clickable’.* The Start Tips icon/page was intended to act as a ‘usability/learning aid’. Given the highly flexible nature of the courseware, the intention was to scaffold learners towards ways in which they can start the courseware. The feedback showed that most participants wanted a clear indication of how to start the courseware, and were frustrated when they did not receive this. They tended to look to other aspects of the interface for guidance, and skipped over the Start Tips because of the colour and shape of its design.

On a final note however, it should be pointed out that most participants were happy with the use of colour, and generally found the courseware’s aesthetics to be professional. It is clear that further analysis is required into specific aspects of the colour, and the design of the graphical elements. In comparison to a commercially delivered product, the courseware prototype is obviously developed by a non-professional. There were a range of reasons for this, and this will be discussed later. To the point, the feedback indicates that whilst aesthetics are important, the ability to learn effectively is even more important in courseware. For instance, in replying to whether the courseware is visually pleasing, Participant_4 (S_E) says “*I does not like the software that is designed professionally or technically, it can show your professional skills in one way, but the most important thing you want people to understand [learn]”.* Thus, whilst well-designed aesthetics and graphics are important, their purpose is to support a strong learning framework to be truly effective and meaningful, and that should not be forgotten.

Navigation

The courseware’s navigational design was designed to be wholly open-ended and flexible. Learners’ could go ‘where they want’ ‘when they want’, and usability/learning aids were

included to assist them. In effect the learner was given full control in regards to navigational fidelity, and the pacing of their learning. First time users were scaffolded via a pre-defined pathway, which took them through a 'First Time Tutorial' covering the basic information on the courseware. This tutorial includes a page on the navigation, where learners' are told that the navigation is designed to be intuitive and flexible, and they are encouraged to 'explore' the courseware in order to become familiar with it. Returning users skip the First Time Tutorial, and are directed straight towards the Homepage. As discussed previously, this page included four menu options. All subsequent screens, excluding the Discussion Board and Site Map screens, utilise a template that includes three of the four menu options. Slight colour changes in the background colour of the main screen areas were included to add to the aesthetic appeal of the courseware. There were four main strains of discussion when it came to participants' feedback of the navigational design. They centered around the: pre-defined path for first-time users; issue of navigational consistency; the use of the browser button navigation; and the mixed opinions on the role of user-learner control.

The qualitative data indicates that participants strongly agree that the linear pre-defined pathway for first time learners is one of the courseware's strength. They believe that it effectively scaffolds learners towards using the courseware in a comforting manner, without overwhelming them. Additionally, one participant believes that routing returning users straight to the Homepage adds to the courseware's usability, by decreasing the linkages to the intended pathway: "*The navigation and easy. And having that start page come up at the beginning, and not appear later is good, because things get annoying when they come up and you does not want them"* (Participant_6 (S_E)). Once participants proceeded to the Homepage and then to the subsequent sub-pages however, the issue of navigational consistency came up. The screen design and layout strongly affected participants' ability to intuitively navigate the courseware. For instance, one respondent believed that the template design was consistent, and aided his 'wayfinding' ability. He comments:

> *"Navigationally it is great, because you've always got the options at hand - you does not have to go searching for them. You can literally just go to the headers and you know where to go from there, it is all clear and concise. Um, once again, just having the options, and also the graphical interface really helps too." (Participant_8 (S_OD))*

For another participant however, the changing colour bars on each screen originally designed to add aesthetic appeal undermines the courseware's navigational consistency, and impedes upon his 'wayfinding' abilities. He comments:

> *"Many screens are different, what's here on the left and right sides, and I think it would be better if they were maybe more consistent or more pointed, so you did not have to go to each screen and think I better check what's there, you just know what's there." (Participant_3 (A_OD)*

For this participant, the consistency of the template's menu design is over-ridden by the strong and differing use of colour on each screen, leading him to become somewhat unsure of the site's navigational capabilities. On the other hand, like several other participants, his feedback implies that he is somewhat against 'exploring' the courseware, and would like more direction when it comes to the site's navigational capabilities. A different issue that respondents' were concerned about surrounded the courseware's apparent reliance on the Browser's Back button:

> *"I got through the preliminary blurb, which looks quite nice, but on a couple of occasions, I reached a screen where I did not want to proceed. However, the only way to go back was to use the browser button. Do you not think a "BACK' button would be useful?" (Web_Participant_3 (A_E, UK))*

In the effort to avoid pre-defining a navigational pathway from the Homepage, the researcher over-ruled the traditional web heuristic of ensuring participants' are able to navigate to their previous page via the site's internal navigation. Unfortunately however, this proved to be somewhat confusing to many participants, whom appeared frustrated by the over-reliance on the drop-down menus as a primary source of navigation.

Finally, there are a range of opinions and perspectives on the courseware's open-ended navigational design. For a couple of participants, the courseware's strength was the navigational fidelity, in being able to go 'where they want', 'when they want'. Nevertheless, even these participants indicate that this approach may be problematic. For instance, Participant_9 (S_OD) points out that although he believes that the problem-driven approach and flexible learning sequence is its strength, he also indicates a desire for clearer guidance on his progress of the courseware's tasks and content. That is, whether he has covered all the content, even if it is not directly relevant to the 'problem' at hand:

> *"I think the learning sequence is good, one of the strengths I think, the way you work through it. What am I trying to say? The logical process um, working through the, what is the word … content! The content and how you work through it is logical, that's what I was trying to say! But, to pick out a, oh i'm struggling for words […] I suppose i'm saying, I wasn't sure with the assignments, if the assignments does not cover every topic, there is to talk about on the webpage, then making it clear there are stuff you does not have to look at in the assignments. So there is more information than is going to be covered in the assignments. Making it clear if you want further information there are other topics, you won't get to work through in the assignments"*

On the whole, it did appear that most participants struggled with the open-ended navigation design. It is clear, that despite the researcher's intention that participants familiarise themselves with the courseware by 'discovery learning', that many would prefer clearly defined navigational paths, and are somewhat put-off by the expectation on them to be more exploratory. The following comment reflects the complexities of this approach:

> *"I mean maybe one of its strengths is having all the options at hand, maybe it would be easier for some people to be just led step-by-step down a certain path. I does not think that would cover everyone, um but certainly for some people it would. Like, you know what I mean? […] I like to have options. I does not really like feeling trapped in, in a corridor which that would be the scenario if as I was just suggesting. I'm not keen on that, so I really do like having the options there and you can sort of swap and change at different times to various tasks. But I do think that some people who are more streamlined in their approach may find that a little confusing perhaps […] [like] once they've finished a certain task maybe they wouldn't know where to go next" (Participant_8 (S_OD))*

Although there was agreement that the courseware design included a rich learning environment, - particularly in the incorporation of Constructivist Learning Environments, there was strong agreement that the reliance on learners' to set the pace of their learning was potentially a major problem. For instance, Participant_3 (A_OD) comments:

> *"My main issue putting my hat on as a student. Will they know what to do? Will they feel comfortable, as students tend to want to be led through things to a degree. Will they know what to go through next, because some of the screens - when you look through them initially, you think 'where do I click, there's stuff on the left, stuff on right, stuff on the top, stuff on the bottom', and some of m students would say 'I just want to go through the sequence I need to, to learn. Not necessarily to be told everything, but to say 'I have to do this, and i've done that, I can move to this'. So, I think there might be a tendency to get lost"*

This academic indicates that he is in touch with students' requirements, as much of the feedback from students' surrounded their requirement for a more structured navigational design. Unfortunately, the usability aids (First Time Tutorial, Start Tips) intended to scaffold learners' towards effective navigational pathways appeared to be less than helpful. That is, the visual screen design over-rode the effectiveness any other extraneous guide to navigation.

Whilst the researcher relied upon the Assignments (problem-based) to drive participants' choice of navigational pathways, students in particular expressed anxiety that they may have 'missed' important content not necessarily related to the assignments. In effect, not all students adhered to a strictly strategic approach to learning, and requested visual guidance that they covered all the course content – even if it is not a requirement of the course. Thus whilst they like the flexibility of being able to go 'where they want', they also imply a desire for a stronger level of teacher-guidance via the navigational design. There were several suggestions regarding how to address the issue of disorientation, and two of the most relevant are below:

"the strengths are the content you've got in there, as in the um assignments approach and the things you want students to do. In my mind the weakness, if there is one, is will they do it the way you want them to […] In some places the navigation is not obvious. [...] I think it is because there's no timeline, it is hard to think how to I jump anywhere? If you had a website with some linear structure, you sort of know where to go. In this, it is completely devoid of timeline, and I think with that you need good navigation. So, 'I know i've done two assignments, and there's another one coming up in a months time, so where do I go to next?' […] Maybe it'll be as simple as a Site Map with memory as to where you've visited, or maybe more than that. Maybe you need a task map, or something that says 'when you've finished, this is all the things you should have done', and 'you've done these ones'. So, if you've forgotten everything that you've done, you can come to this or that and see other things you've got to do" (Participant_3 (A_OD))

"a critical path diagram that may help um, perhaps, at one end you've got the start at the other end you've got an outcome, and if it can be graphically represented that you're at a certain stage and that you're progressing on to the next stage, but maybe keep the good aspect for me which is having all the different options maybe you can jump and go, so you may have completed stage one, then stage three, then stage two. But if people wanted to go one, two, three, four, five, then they can too. That could be handy" (Participant_8 (S_OD))

In both cases, participants advocate that the issue of disorientation can be alleviated via the visual screen design. The first participants' concerns coincide with those of students, and his suggestions are supported in the feedback of other participants. In particular, the feedback of students, as already discussed, indicates that they won't necessarily adhere to following the 'assignments approach' to navigation. Both participants suggest a way in which the courseware can be more user-friendly by enabling a more structured format, without compromising the ability for learners to freely navigate 'where they want', 'when they want'. For the second participant, this means chunking the content into stages and including visual hyperlinks indicating to learners' 'where they are' in regards to the learning path, however enabling them to navigate out of that sequence at will.

The researcher's intention to provide a learner-centered problem-based courseware meant that the navigational design actually impedes upon learning. Thus, it appears necessary to re-work the concept of learner-centered, to include a stronger focus on more effective methods of teacher-guidance. At first, this introduced a complex problem for the researcher to grasp conceptually. That is whether a more structured approach necessarily impedes upon the basically constructivist philosophical approach to design? It becomes clear however, that implementing a visual site map doesn't necessarily enforces a 'route-learning' approach. Furthermore, the qualitative data provided a plethora of design ideas that has the

potential to extend the capabilities of the courseware design, and emphasises the importance of evaluation to achieve this.

(iv) Collaborative tools

The courseware included a plethora of tools to enable peer-to-peer collaboration with both the lecturer and other students. Students can communicate asynchronously or synchronously with other participants. They may choose to collaborate on a one-one or group level, and as such have the facility to communicate privately if they wish. The courseware gained inspiration from theories on social-constructivism, and included supplementary 'hot-links' to the communication tools in the interface design and collaborative-activities for the coursework and assignment, in an effort to promote collaboration and scaffold learners through the Zone of Proximal Development. Interestingly, the qualitative data shows that participants may use the collaborative tools not only for learning purposes (as discussed later), but also as a means to troubleshoot usability problems. For instance, Participant_5 (S_E) points out that the courseware is relatively user-friendly *"particularly as it is in a supportive structure".* He comments:

> *"And the communication between the participants would be really important, so that people can troubleshoot each other's use of it. So I would be keen about building the identity of the group".*

Whilst he believes that the 'Who's Online' page and the Discussion Board tool are important however, he also points out that the courseware is simply an enabler for collaboration to occur. Furthermore, he points to the face-to-face Introductory Seminars as essential for building up the group's identity, and participants' confidence in peer-to-peer networking to troubleshoot usability and learning problems they may have. Thus, highlighting the earlier data that emphasised the need for courseware to maintain a strong face-to-face component. There is a range of other issues on the user-friendly design of the collaborative tools, the most significant being the design of the Contact page. This page avoided using a <mailto> link that causes the browser to open up a new program, and included an online form in an effort to assist peer-instructor collaboration. Participant_6 (S_E) comments "*This page I liked […] it gives you a little form to fill in, and that seems quite convenient for a lot of people I would think".* This feedback further highlights the way in which the usability design of courseware can alleviate the pressures of learning online.

(v) Usability aids

The qualitative data shows that inclusion of usability aids is essential in scaffolding students towards being effective 'eLearners'. One participant in particular, was concerned about catering for different levels of computer literacy. Despite the rapid growth of technology in the past decade, she points out that that not all students are effective users of technology. Thus

it is important to include a range of help tools, designed however in a way that effectively caters to the various demographics:

> *"… having tutored first year students before, you get a wide range of people that are, you know … you have some more mature age students but they've never touched a computer, and they're learning quite different from the ones that have come out of grade eleven and twelve. And some of them are quite computer literate, but a lot of them are not still which surprised me. But you know, so there are varying needs as far as support goes […] you does not want to sort of harp at people that does not want to go to those sections, but if you provide them then people can like […] actually look up the things they want. So the more you provide, people can look up if they feel they need support, and if they does not need support they does not need to worry about it." (Participant_6 (S_E))*

The qualitative data showed that there were a range of opinions on the design and inclusion of the courseware's usability aids. For instance, some participants believed that various aids were unimportant, whilst others considered them essential. In other cases, the rationale on the usability was supported, however the graphical design and/or layout impeded upon its effectiveness. The overall impression however, was that whilst participants' expected most of the usability aids to be a default component of courseware in general, one of the prototype's successes is that it goes even further in facilitating usability for different levels of computer literacy and language skills. The usability aids are the range of tools included in the courseware, which were designed to assist learners with different levels of computer literacy in using the courseware effectively. These include the: First Time Tutorial (which has seven screens dealing with Minimum Computer Skills, Hardware and Software Requirements, Navigation, Worksafe, Computer Security, Flexible Learning, and Additional Support); Help page (which has three sub-sections for Content, Technical, and Other Help); Sitemap (which includes a Search Bar); and Start Tips (as previously discussed).

The inclusion of the First Time Tutorial inspired much discussion amongst participants. There was general agreement that it effectively scaffolded learners' towards using the courseware in a way that they found stress- free and comforting. Participants' believe that it would help participants become accustomed to the courseware. As Participant_8 (S_OD) points out "*That was very handy to go through the first time tutorial, to get a feeling of how the program works really, I guess, which is pretty important".* Participants liked that it purposefully covered areas designed to assist them in 'using' the courseware, and indicated that their experience of courseware tends to exclude these aspects, which can be detrimental to students' ability to learn online. For Web_Participant_2 (S_E, Canada, ESL) the tutorial's strength is that acts as a usability aid for a diversity of learners', she says, *"The tutorial is excellent. It covers many "too often for granted" areas that may push learners from diverse cultural backgrounds out on the curb"*. Participant_1 (A_E) on the other hand, liked that it covered basic content,

without overloading the student with extraneous information associated with using the technology. He also likes that students are introduced early-on to the assignment and tutorial tasks, which were intended to inspire participants' navigational decisions:

> *"I like that tutorial because it gave me a clear idea that the learning was chunked into tutorials, and you spoke very early on between the relationship between the assessment and the tutorials, and I think that was extremely good and comforting for the user to be made aware of at an early stage […] I noticed you were very gentle and brief about the requirements you expect people to have here, you did not give them a long spiel about this is the software you should have and this is how you're going to install it, so once again it was adequate for the purpose and communicated well with the student".*

A few participants however, recognised the danger in relying on the First Time Tutorial as a usability aid. One points out that many students does not like reading from the screen, and would skip through the content and not necessarily read it even if it is there. He points out that face-to-face meeting are important in assisting with the courseware's usability, as the lecturer can go walk-through it and provide any necessary explanations. Another points out that a lot of information is covered, which for a first time user may be overwhelming. His feedback appears to substantiate the feedback of the former participant. He believes that the content should be available for returning users in a category that chunks the content into sub-sections. The first screen of the tutorial however, informed participants that this feature was provided for. A post-evaluation of the courseware would help uncover whether the option to print out the tutorial is effective for those whom prefer not to read off the screen, or those whom require a reminder of its contents. Nevertheless, it is clear that the courseware must effectively integrate a user-friendly design, in order to ensure learners' are not over-reliant on the usability aids.

The inclusion of the Help icon did not generate much discussion, and it is unclear how relevant this section was to the courseware. Most participants had not viewed the Help Screen, but expressed approval of its contents upon the pre-interview walk-through of the courseware. In particular, they liked that they could receive both Content and Technical help, however it was apparent that the link to Other Help should be named to indicate that it is the location of the First Time Tutorial contents. Several people indicated that they expected this section to be a set-component of the courseware, however a post-evaluation of the courseware is required to assess how it is used in a real-world setting. The researcher's impression was that participants were somewhat unwilling to seek Help via the interface if they were concerned about a technical or design-related issue. They appeared to prefer direct feedback from the designer/researcher, or to leave the problem 'as is' if possible, rather than taking responsibility for researching solutions or troubleshooting it themselves. A tentative finding is that a requirement of courseware is for higher levels of user-friendliness,

as the additional strains of online learning mean that students are less keen to rely on usability aids such as the Help component.

The Site Map is another usability aid which most participants expect courseware to include, however unlike the Help component it introduced much discussion and slight conflict. When asked what usability features would help them learn nearly all the participants referred immediately to the site map. Nevertheless, there were a few respondents whom expressed a belief that the inclusion of Site Maps within courseware is questionable. For instance, Participant_5 (S_E) comments, *"I does not imagine that many students are going to use the site map. It requires a way of thinking that's not universal".* It may be that this participant's perspective disagrees with others, however the analysis of the data as a whole tends to point to an intriguing finding. That is, the concept of and expectations relating to a site map for courseware appears to be much more sophisticated for courseware design. It appears evident that a site map designed for a traditional web site cannot be translated and utilised effectively within an education setting. These site maps indicate, either graphically or via text links, the contents of the site's major sections and sub-sections. When it comes to courseware however, respondents - particularly those whom express a strong Spatial Intelligence, request that the Site Map graphically (as opposed to textually) indicate 'where they are', 'where they've been', and 'where they haven't been'. For instance, (Participant_1 (A_E)) says:

> *"Um, the way I would like to see a site map and I does not know if this is possible, what would help me immensely is to display the site map, and shading the areas that i've visited because sometimes a piece of courseware can be very discomforting. Because you get to what you think is the end, but you're not quite sure, there might be a huge amount that you've missed out along the line".*

There is strong agreement amongst participants' that this type of site map would significantly aid usability, by reminding them where they've been, and acting as a buffer towards where they believe they should go. It may also be that the inclusion of the Site Map as a usability aid may be defunct within courseware, if the Homepage is designed as a visual Site Map and functions interactively in the manner suggested above. As (Participant_2 (A_E)) says, *"I like to see the big picture, of where everything is … I always want to know where I am. In fact, a homepage for me should be a site map".* It is apparent that the open-ended nature of the courseware' design has resulted in a strong call for more visual guidance, such as through the site map. Whilst respondents liked the flexibility of control they have over the interface design, the open-ended navigation design is somewhat unsuccessful in facilitating the problem-based learning approach. A redesign of the interface is required to act as a visual metaphor of a Homepage/Site Map.

The final usability aid to be briefly discussed is the Start Tips. The design and location of this icon on the Homepage has already been discussed. In short, participants passed over this icon on the interface so it is unclear how helpful they would have found it. Nevertheless, the researcher would like to reiterate how this is an example of where poor graphical design influences usability. On the other hand, the intention of this component was to scaffold learners' use of the courseware, by providing suggestions of 'what to do', and 'where to go'. In light of existing findings however, participants' request for more structural guidance via the visual interface design tends to indicate that this component may also be invalid.

(vi) Learning aids

Although it is a relatively new field, the concept of 'flexible learning' tends to invoke a concept of flexibility in terms of 'time and (work)space' as opposed any pedagogical associations. Furthermore, when it comes to 'e' learning, the definition infers that the role of learning is reliant upon interaction with a personal computer or laptop. The reliance on technology often comes to the detriment of teaching and learning online. Technical problems often frustrate, and sometimes impede upon usability, including: problems accessing the Internet; availability of appropriate software; and faults with the hardware. In addition to this, a lack of consideration or poor decisions regarding the accessibility design may inhibit the ability for courseware to enable effective learning. For instance, the majority of computer-based-training (CBT) in Australia relies upon Flash software, necessitates high-level broadband capabilities, and due to software design constraints cannot/refuse to provide a print-function. Thus, training cannot easily take place outside the realm of technology. This courseware was designed to fully exploit the possibilities of flexible learning, outside the scope of conventional courseware. Keeping in mind issues associated with accessibility, technical problems, and personal learning styles, participants' were provided with options that enables them to: (a) download the main course content in a range of multi-media formats (text, audio, video) (b) printout most of the interface screens in an accessible format (word, pdf, html) (c) access a copy of the static courseware via CD-Rom (designed specifically for those with low-level Internet connections, however they're still reliant on the online courseware for collaborating with peers and the lecturer) and (d) complete much of the course in a physical environment of their choice, as they can choose to be less reliant on technology.

The provision of multimedia and download capabilities resulted in much, mostly positive, discussion within the qualitative feedback. As Web_Participant_5 (ID/WD, USA) comments, "*I love how you have provided choices as far as how a student can see or hear the material*". Given the strong links participants make regarding the way in which the usability/accessibility design here facilitates their personal learning styles, the researcher considered it appropriate to include the discussion of these options within this component of the chapter. Nearly every participant indicated that the flexible learning options are one of the courseware's strengths.

Respondents generally agreed that the provision of audio and video were something that made the courseware particularly special. They believe these options would help motivate visual/auditory learners' in particular, although they also recognise that same participants' may preference the text-based options.

For instance, Participant_10 (S_OD)) says, "*Someone may have an ipod and then they click ipod and then someone maybe like to look at mp3 audio then click next. Its very good, very special*". Another respondent (Participant_1 (A_E)) says, "*you've made the basic content which is provided through video […] probably that's one of the major things which will make it go really well. Congratulations*". Several participant's were particularly keen, and believed that the provision of a range of options from video, audio, to text were particularly essential because of the range of ways in which students' prefer to learn. For instance, Participant_9 (S_OD) says, "*You've got to have it. Sometimes it is better to look and listen to something, rather than read it all. You've got to have that*". On the other hand Participant_3 (A_OD) says,"*I think the idea, having those different models is good for someone who doesn't want to watch a video then they can just read the text*". In contrast, Participant_6 (S_E) believes that the mix of video with face-to-face lectures would help her, because she would "*prefer seeing a face rather than just hear a voice*".

Whilst participants generally agreed that the multimedia options were essential, they were also keen on the download options. They believe that the ability to download content in a range of formats is particularly useful, and enhances the courseware's usability design. For several participants, the ability to move away from the online environment is one of the courseware's strengths, and they believe it would help motivate them if undertaking an eLearning course. For instance, Participant_2 (A_E) says, "*I particularly liked this option to get out and print it, and get away from the machine occasionally".* In addition, Participant_8 (S_OD) says, "*Maybe one of its strengths Is having all the options at hand"*, and then points out:

> "*If you were someone who liked being outdoors and did not want to be sitting at a desk, you could download the podcasts which would be great to just be working on-the-run sort of thing, and then those that are more inclined to sit at a desk can read the text-based ones"*

Some participants' pointed out that the emphasis on the flexibility of the media and download options is essential, because it addresses the need for accessibility. Web_Participant_2 (S_E, ESL, Canada) points out that enabling content to be printable, available on CD-Rom aids accessibility, as students can effectively access content regardless of the type of equipment or Internet connection they use. She points out "*Everything can be printed, everything is available on CD-Rom. This is so "in synch" with reality*". Furthermore, she believes that providing lectures via text, video or audio also addresses students whose

second language is English, by helping them "*understand the content and (improve) their reading and writing abilities through example*" and "*therefore reducing the demands of learning with a second language".*

Although there is general agreement that the multimedia and download options: enhances the flexibility of the courseware; addresses important usability issues; and targets a range of learning styles on a broader scale, there is also a slight hesitation from some participants in embracing these options, and it is clear that post-evaluation of the courseware is required to fully understand how these options would be used within in a real-world situation. For instance, whilst Participant_4 believes that that the having these options is *"very consideration, you know!"*, she also says "*I'm not sure, people will actually choose these options".* In addition, Participant_1 (A_E) believes that providing the content in different formats is excellent, and gives students the opportunity to move away from the online engagement. Nevertheless, he also points out that the process of uploading the multimedia adds an additional workload for lecturers, and that expecting students to download the content for each section is time-consuming. To address the latter, he emphasises the need for an improved methodology, in which students may download the entire course content in the format of their choice, via the Downloads screen via a limited number of clicks. Again, a post-evaluation of the courseware would better address issues associated with the development and application of these learning aids.

(vii) Evaluation

Finally, the qualitative feedback indicated a mixture of responses regarding the prototype design, which necessitates discussion here. Face-to-face evaluators from Higher Education tended to express more positive reaction to the prototype design, and this may be because they had the opportunity to walk-through the courseware with the interviewee. Participant_1 (A_E) in particular was comforted by inclusion of placeholders, and says *"I liked the fact that in most cases it says fit 'this is not finished yet, but this is how it is going to be done"* He believed that *"it made the experience of trying to use it for the first time much more acceptable".* Non face-to-face evaluators, particularly professionals, tended to be critical of the prototype design, and this may be because they couldn't clarify any issues they had with the design immediately. On the other hand, the researcher also believes that their criticisms may also reflect a lack of familiarity with the process of prototyping, and a misunderstanding of the philosophical underpinnings of the design. For instance, one professional (Web_Participant_7 (ID, USA)) pointed out that he was surprised that the researcher was releasing the courseware because the activities and multimedia were undeveloped, and criticised, "*I does not think it is ready for primetime".* Frustratingly, he points out *"there really doesn't seem to be anything new here"*, because of the inclusion of 'content, activities, lectures, assignments, discussion boards' as opposed to how these components are

designed to scaffold learners towards deeper and more independent learning. Much of his feedback stood in direct contrast to that of students in particular, and it is clear that his perspective is out of touch with that of learners'.

Nevertheless, whilst other participants appeared to be satisfied with the conceptual design, a post-evaluation of the courseware is clearly required. As Participant_2 (A_E) says, when it comes to assessing the user-friendly design *"I does not think you could really find those things until you looked, until you were actually doing it and exposed"*. The perspectives of students often contrasted to those of academics and professionals, and a post-evaluation of the courseware would further elucidate whether these differences of opinions held once they actually used the course in a real-world situation. Furthermore, it would confirm whether other findings from the prototype evaluation held, and potentially provide further insights into issues such as the value of the welcome video, the personalisation of the courseware, and whether the peer-to-peer networking opportunities were actually used to troubleshoot technical problems.

6.3.2.4 Aspects of the Learner-Friendly Courseware Design

The feedback on the first four open-ended questions on the courseware's 'user-friendly' design is discussed above. The researcher found that there were strong linkages in regards to the way the interface design and usability aids influenced participants' ability to use the courseware, and their motivation to learn online. She also found that there were noticeably different concerns from participants, according to their occupational group. Furthermore, there appeared to be some level of confusion from web-based participants regarding aspects of the design, which were reflected in their feedback. The subsequent open-ended questions posed to interview participants surrounded aspects of the learner-friendly design. These included questions on the way in which the courseware facilitated: an appropriate level of instructional guidance; independent learning; and, deep learning. Interviewees were encouraged to extrapolate on their initial comments, as well as provide any additional feedback on their perception of the strengths and weaknesses of the learning design. The result is also a matrix of complex data, however the process of Grounded Theory methodology eased the way in which the data could be analysed in terms of sub-themes. Interestingly, the majority of specific feedback from the web based participants centered on the user-friendly design, and they tended to provide only general comments on the learner-friendly design. There was one participant (ID) whom provided some illuminating and controversial feedback on the courseware's activities and the role of rote-learning, and his comments will be analysed in line with the interview participants.

In overview, the commonality amongst participants' centres on the importance of designing for learning, and the way in which participant's personal motivation may or may not be

catered for via a fully-online courseware. Most participants' agree that the courseware's strength is the learning design, in particular the way it caters to flexible and deeper learning structures. There is however, a trajectory of responses regarding learning design, both within the courseware and generally. These centered quite specifically on the level of teacher-centered guidance, and the role of behaviourist versus constructivistic approaches within eLearning. For example whilst some participants wanted to be led through the courseware, others liked the open-ended approach. In another example, the feedback from students in particular indicates that behaviourism and constructivism may indeed be complementary within design. They strongly supported the activities aimed at both lower and higher order thinking skills, and point to the way these interactions strongly enhance their motivation through engagement. Nevertheless, there was one instructional designer in particular who critiqued the inclusion of activities promoting lower order thinking. There was also hesitation by academics that point to the extra time/effort taken to develop these activities, and the need to quantify the value added in terms of student numbers. The section below discusses the range of feedback for the learner-friendly design, according to: Instructional Guidance; Independent Learning; Deep Learning; and, Other Aspects of the Learning Design.

(i) Instructional Guidance

The courseware's learning design utilises a learner-centered approach, and was inspired by a constructivistic mindset. The design is open-ended and flexible, and as such it somewhat enforces learners' towards becoming self-directed and independent. The problem-based assignments drive the learning and assessment, where the usability/learning aids and collaborative tools aim to scaffold and facilitate learners' progress. The courseware cannot and should not be defined as design that is wholly and purely constructivist however. Mainly because, the definition and application of constructivism as utilised by the researcher is interpreted in a wholly subjective manner, and she anticipates that there may be some whom disagree with her translation. Furthermore, it includes for instance, activities that are aimed at lower order thinking skills, in which learners' rote recall and regurgitate facts. The qualitative analysis regarding the level of instructional guidance provided within the courseware shows that there are four areas of thought. The first area of though indicates satisfaction with the level of instructional guidance. A few people believed that the level of instructional guidance was adequate, and one in particular liked the way in which the courseware layered the learning so that students' may take a surface or deeper approach. As participant_1 (A_E) says:

> "*I think it was good in that you've allowed people to go through it at a surface level if you like or a top level, but if they need to go deeper they can, but they can skip that if they does not feel the need to".*

The second area of thought indicated a requirement for stronger levels of guidance, particularly amongst students. Several participants were keen to point out their pleasure with

the high level of control they were given, regarding both the navigational fidelity and their learning. Whilst they believe that the flexibility of choice is good however, they also indicate a requirement for stronger levels of guidance. They point out that it may be possible for some students to 'get lost', particularly those whom require a stronger level of direction from teachers. Some participants believe this may be highlighted by the fact that the courseware is aimed at first year university students, whom are not used to a self-directed learning approach. Furthermore, whilst they believe the learning aids (such as the First Time Tutorial) and collaborative tools would help, they're not sure that they're entirely adequate.

Participants' suggestions unanimously indicate that a stronger level of instructional guidance may be facilitated through a redesign of the interface. Several suggest that the courseware include a visual interactive site map, either at or available via the Homepage. They would like to see a graphical indication of the courseware's main contents, so that they know 'where they've been' and 'where they should go next'. A few suggest that the courseware could lead them more directly through a sequence, where each screen shows them clearly 'where they are', but allows them to skip to 'where they want'. Interestingly, the researcher's initial desire to create a learner-friendly interface may mean that the courseware impedes upon this. The central issue thus, is whether a more structured interface design enforces a behaviourist approach. The education provided to the researcher from her participants' indicates that this is not necessarily the case, and that a few alterations to the interface design to provide more structural guidance, may significantly improve the courseware's learner-centeredness.

The third area of thought indicates a level of ambiguity and uncertainty. A few participants' comment on the need for courseware to provide an appropriate level of instructional guidance, nevertheless they avoid effectively answering whether the courseware achieves this. Other participants are not entirely sure whether the level of instructional guidance is adequate, and indicate a requirement for a post-evaluation of the courseware from a learners' perspective in order to better assess this issue. As Participant_2 (A_E) points out, "*I does not think you could really find those things until you looked, and until you were actually doing it and exposed".* He also points out that the difficulty in designing for learners, because this type of learning is new. When asked whether the courseware includes an appropriate level of instructional guidance, his initial comment was:

> *"Um, um, i'm not sure at this stage. I guess you have to think from the perspective of the person coming in to the course […] But yeah, I guess you're also looking at a stage where this type of learning is still new. Out of the 500 or so people who might do the course, there might only be 50 of them who've done it before, whereas in 5 years time there'll be 300 who've done it before. So it is an evolving changing thing".*

The final area of thought comes from participants', particularly those from Education, whom imply that the level of instructional guidance may be somewhat inadequate. They suggest a

plethora of ways in which this may be addressed. A few participants focus on the ways peer to peer social collaboration may be used For instance, Participant_4 (S_E) suggests that we "*build this group so that anyone that gets into difficulty has a range of options*" He extrapolates "*obviously they can come to the presenter, but sometimes people does not want to ask dumb questions […] the role of the co-learner is really important".* Whilst this respondent believes the courseware provides the tools for collaboration, he (and other interview participants) also point out that a face-to-face introduction is essential in building up the community of learners. It should be noted out that the course includes a range of optional face-to-face meetings a post-evaluation is required to assess how effective the collaborative design has been in facilitating peer-to-peer linkages.

(ii) Independent Learning

The literature in Higher Education supports the requirement for students to become more self-directed. As new pedagogical approaches move away from teacher-centered approaches, there is an equal expectation on students to take more control of their learning. The courseware attempts to promote independent learning through the problem-based approach where the assignments act as the 'problems' which drive student' navigation and use of the courseware. The qualitative data shows that participants, particularly academics, believe that independent learning is essential when it comes to academia. They also believe that this is very difficult to achieve however, as it depends on students' zone of proximal development and self-motivation. As participant_3 (A_OD) points out:

> *"I think it is essential for university students. I'm having experience of that this coming semester, where i'm trying to get my third year students to take more independence. It is very hard. I think this is targeted at first year students is not it? I think that at this age, it needs to be an aim with a gentle introduction, because they are not ready to be thrown into 'pat on the bag, ok you're an independent learner'. But I think certainly we need to ween them off how they learn at school, and help them to understand that at this level it is about them learning and not us teaching".*

Nearly all participants' unanimously agree that the courseware provides the opportunity for independent learning to occur through the constructivistic approach it takes. They point to the assignments-based approach, the case study, the abundance of links where learners' may access further information, and the feeling that they're in an supportive environment with access to a range of help and collaborative resources. For instance, the participant above comments:

> *"I think it does, if it is successful, because you've got things like saying 'here's a question, and a link to find out more', so someone can think 'I does not know what i'm doing here' but this is a way to go find out'. So, I think that's heading in the right direction...to have that nice amount of support, and to get that balance right, so you're*

> *not just saying 'click here for the answer' but you're saying 'here are some more resources, and you make the choice of how you use them'.*

The concern however, is that whilst participants' believe the courseware may enable independent learning, they are not entirely sure whether this will occur, or may have issues with the requirement for independent learning. Participant_4 (S_E) for instance, believes that a big part of this response comes back to the whether the courseware effectively addresses learners' zone of proximal development. Whilst he "*can't see any obvious problems*" and believes "*there's certainly potential there*", he also points out that for some learners it may be within, for others it may be stretching their zone of proximal development. Thus, a post-evaluation of the courseware is required in order to assess how effective the courseware has been in addressing and anticipating learners' zone of proximal development.

Several participants point out that their ability to learn independent is directly influenced by their self-motivation. Nevertheless, their feedback also indicates that addressing specific design guidelines may positively influence their motivation. For instance, Participant_8 (S_OD) comments that, *"it would depend on the subject matter".* If the content held his interest then he would *"be really happy to go out there and find any information about it and process it"*, however he comments "*if it was something really dry, I guess i'd find it hard to start I guess, and I would need something to follow".* Interestingly, he believed that the courseware's strength was that it was motivating, He says:

> *"It is a really involving website, and it does motivate you not only graphically but the way in which it is put together, like the formulating of the assignments and things like that, and the option to collaborate with others through the chat, I think they all work together to make it something that you really want to be doing .. it is motivating I guess"*

Thus, it appears that the inclusion of attractive aesthetics and constructivistic design elements (problem-based assignments and collaborative learning) positively engages this learner online, and by implication would inspire him towards an independent and deeper learning approach. Further analysis would assess whether these elements would enable learners' to become engaged with the content, and better able to work independently, regardless of their initial perception of the subject matter.

In another example, poor usability design and a requirement for group participation negatively influenced Participant_2's (A_E) perception of courseware, and his desire to take a more active approach to learning online. On recalling on online course he once completed, he says "*I can't think what it was, but I just got frustrated with it […] and I just couldn't stand it".* His frustration centered on the fact that it was "j*ust complicated and awkward, and there was a requirement to participate in group stuff"*. The researcher would tentatively suggest

here, that whilst social constructivists point to the importance of peer to peer collaboration, it appears that in practice learner's control of how they collaborate, is equally important.

This leads us into our final point regarding independent learning. The qualitative data indicates that whilst participants' understand the importance of independent learning, a few indicate that their personal learning style necessitates a high level of social collaboration, either with the lecturer or other students. For instance, Participant_5 (S_E) comments, "*I'm not the world's most wonderful independent learner. I tend to need something that's regular*". She points that the nature of online learning is not necessarily 'regular', and indicates that she's inclined to drop out without the option of regular face-to-face contact with other students. Thus, despite its best intentions, the courseware's ability to foster independent learning may be impeded by some participants' personal learning approach, particularly those whom preference a face-to-face learning environment.

(iii) Deep Learning

Research in Higher Education emphasises the need for students' to move away from a surface learning approach, which tend to facilitate lower order thinking skills where information is 'regurgitated' through a process of 'rote memorisation'. Within this approach, students generally cover only the basic course content at a rather superficial level. Their ultimate goal for students' is move towards a deep learning approach, which tend to facilitate higher order thinking skills where information is 'analysed, redefined in meaningful ways, and interpreted' through an 'internal (cognitive)/ external (social)' process of 'construction and co-construction'. Within this approach, students generally take a stronger level of responsibility for their own learning, delve beyond the basic literature, and collaborate in order to assist with creating new and deeper knowledge structures. Many researchers, particularly those within Education, believe that approaching design from a constructivist philosophy or pedagogy encourages a deeper learning approach.

As discussed earlier, the courseware utilises a constructivist-based approach in a number of ways, such as the: design of the objectives (these are flexible, and learners' are able to contribute to co-constructing the objectives and how they fulfil these through the assignments); problem-based approach (each assignment works as a 'problem', and students' must take control of their learning by contributing to 'refining the problem' and deciding how they will 'solve the problem'); constructivist learning environment case study (this imbeds a real-world situation, encourages learners' to construct their own understandings through reflection and collaboration, and acts as an exemplar of an end-product for one specific assignment task); and the social networking design (which provide the opportunity for face-to-face discussion, private and group discussion online, synchronous and asynchronous communication).

When it comes to deep learning, Participant_6 (S_E) points out that students are sometimes the learners they want to be, and although the courseware has provided the tools for a deep learning approach, some will come from a surface or strategic approach. Nevertheless, most participants agree that the courseware facilitates a deep learning approach, in a way that is regarded as both creative and innovative. The qualitative data shows that most participants - academics and students from Education in particular, strongly subscribe to a constructivist philosophy, and point out that this approach fosters a deep learning approach. As Participant_5 (S_E) replies in regards to whether the courseware prototype fosters deeper learning, "*Um, one of my basic propositions, and its a constructivist one, is that we continually construct and reconstruct our knowledge in conversations in order to be able to act".* This leads us into the finding that most of these respondents believe that deep learning is directly facilitated through a process of both personal and social constructivism.

Furthermore, that in order for learners' to be higher order thinkers, they must be scaffolded through the zone of proximal development. A few respondents go further and point out that the deepest level of learning can only occur when the course fosters a strong 'community of practices', where learners' interact with their peers on a highly collaborative level, and create a complex discourse on the course' subject matter. As Participant_5 (S_E) says, it is not enough to provide for personal constructivism, "w*hat you really want is for the group to become a community of practice".* When it comes to courseware design Participant_1 (A_E) also supports the requirement for social collaboration, and comments, "*usually the deep learner will be asking questions which are not provided by the materials that you give*".

Thus, they believe that a strong student-lecturer and/or peer-peer relationship must be enabled and built up, in order for deep learning to occur. The qualitative data did however include a range of feedback regarding the requirements for effective social collaboration, some of which appear to be slightly contradictory. This will be discussed below. The researcher would also like to point out her interest here, that the professional group were silent in regards to the matter of social collaboration within eLearning. Commercial training packages are often marketed as 'effective learning strategies'. Nevertheless, the vast majority exclude any type of social collaboration, for a number of reasons – mostly centering on concerns on estimated costs, the desire for profit, a lack of knowledge/ability regarding design and implementation, or a desire for quantitative proof that implementation will result in increased course numbers.

The qualitative data shows that participants' range from being not sure to strongly agreeing that the courseware facilitates deep learning. Those that were not sure however, also believe that the courseware provides the opportunity for deep learning to occur. Their hesitation lies

mainly in the belief that one must process the course as a student from 'start' to 'finish' in order to be fully sure. As Participant_2 (A_E) says, "*it is hard to say without processing the path, the actual learning and the process they might go through, but certainly I think you've provided an opportunity for that to happen*." Generally however, there is agreement that the courseware's strength is its learning design. Several participants' believe that it caters to a more sophisticated level of learning than they have come across within their own research and practices. They suggest a level of innovation, in regards to the way the tools are put together in a way that is motivating, and encourages a process of personal and social construction. For instance, Participan_1 (A_E) comments,

> *"They way I look at courseware I design is that you will at least be able to pass the course using the courseware. Yours I think is superior to the stuff I normally provide, and they might be able to get a credit for example, but it seems to be in the nature of the learner to be able to interact with the teacher to be able to get to really deep things. And usually the deep learner will be asking questions, which are not provided by the materials that you give. […] Certainly you've facilitated a much higher level of learning, than i've seen in any other courseware design. […] I think you've succeeded. I think it is pretty good".*

Participants' points to four specific features that they believe encourages a deep learning approach, including the: objectives, assignment-based approach, constructivist learning environment, and collaborative design. Each of these four features will be discussed below, in more detail.

The courseware provides basic objectives, in which learners' may interact with the instructor to co-develop in order to focus on specific areas of interest, and self-direct their learning so that it is meaningful to them. Participants' emphasise the need for objectives to be both clear, and co-constructed in order to be effective and engage then in ways that encourage their self-motivation. Most believe that the courseware effectively caters to this requirement, although a post-evaluation would be required in order to fully assess its effectiveness. There were a few participants' – namely students, whose feedback implied that they might be somewhat uncomfortable with the requirement for them to take an active role in developing their objectives. These participants' may subscribe to more strategic methods of learning, as they indicated a desire for more teacher-centered direction. Nevertheless most respondents appeared keen, and several pointed out that the level of choice afforded to them contributed to a strong sense of engagement and self-motivation. Participant_5 (A_E) was the most explicit when it came to the design of the objectives, He points out, that the courseware has been designed on the assumption that the objectives are shared, and supports the ability for students using the course to 'slightly modify' the objectives:

> *"One of the things i'm really keen on with eLearning is that the learner is clear about what their objectives are, so uh, this is the presenter's objectives, and I would be*

> *encouraging the students to be thinking about what their objectives are. But everyone has additional objectives. I learnt this when I was principal of [College Name]. All the education programs were operating on the assumption that all students want to get the highest mark, and I think that was a mistake because the objectives should be negotiable between the teacher and the student".*

There was resounding agreement that the problem-based approach to the assignments encourages learners' to become more independent, take control of their learning so that it is meaningful and engaging to them, and that it fosters a deeper approach to learning. As Participant_3 (A_OD) comments, "*the strengths are the content you've got in there, as in the um, the assignments' approach, and all the thing you want the students to do*". Several participants point out that the range of options provided in the assignments provides them with a flexibility of choice that is motivating, because they have an active role in deciding 'what and how' they will learn. They believe that the assignments' encourage a deeper learning approach, as students' are encouraged to reflect, actively interpret, and 'co-construct' within real-world environments that scaffold their understandings. A few people however, pointed out that the expectation on students to 'develop a webpage' may be problematic, due to students' varying levels of computer literacy. They suggest that the task be modified, so that they have a stronger level of direction in regards to how they handle the technical aspects, such as uploading a pre-defined html template, which students could use as easily as a word document.

The courseware included a real-world case study, based on Jonassen's design for constructivist learning environments. Here, students' were provided with the 'context' of the problem, the problem itself, and four questions on the problem. To help them answer the questions, three characters, which further contextualise the real-world environment, and scaffold learners' towards constructing an answer, provided 'advice'. To encourage personal and social construction, students' are encouraged to post their feedback on the discussion board, and reply to another student's post. A percentage mark is afforded to them for their input, to provide them with incentive to take part in this activity. Resoundingly, participants' agree that one of the courseware's strengths, and a component, which most encourages a deep learning approach, is the inclusion of this 'case study'. For instance, in reply to whether the courseware enables a deep learning approach, Participant_3 (A_OD) comments:

> *"I think it does, again because you've got things there, where they're thinking about a case study and trying to write about what they would think of some of the advice or whatever, which is very different from saying 'read this' and they give you a summary. So, I think that is also getting them in the right direction moving them away from thinking 'I have to take this information in and regurgitate it'.*

As mentioned above, participants' believe that providing for social collaboration is one of the ways in which the courseware may contribute to deeper learning. For instance, Participant_4

(S_E) believes that the value of the discussion board is that it actively engages learners in an important discourse that scaffolds their existing knowledge structures towards new meanings. She comments, "*so maybe it is hard to get deeper thoughts, but if you have someone to discuss with you, maybe you can think deeper*". There are a range of issues and conditions that they bring up on the design of social collaboration. For two participants, an element of face-to-face contact is essential and preferable, in order to target their personal learning style and build up a community of learners. There is slight level of disagreement when it comes to the way the discussion board is utilised, whilst some agree that its use should be 'compulsory', others believe that enforcing online communication – particularly group work is frustrating.

Several participants' point out the requirement for both facilitated and non-facilitated discussions, so that participants' may privately communicate and ask questions they would feel uncomfortable in front of the instructor. There is a requirement for discussion boards and chat rooms that are active with a high number of contributing students, as the alternative is perceived as frustrating and de-motivating. For instance, Participant_10 (S_OD) comments his use of discussion boards "*would depend on how many people are online and how soon we need the information"*. In addition, Participant_6 (S_E) points out the need for online chat to include pre-defined times for online discussions. She points out that she was involved in a project where a group of teachers worked 'in a certain way' and 'were busy', so that when they did logon there was no-one else there at the time, *"so it failed because there's no set time".*

Thus whilst it is clear that courseware must at least enable a teacher-student relationship, and that fostering a community of learners' is essential, there is slight hesitation in regards to achieving this through the use of discussion board or online chat alone. As two academics point out that the success of online discussions often depends on the group, and some groups just are not keen to collaborate via discussion boards. Whilst online chat might help, the times must be pre-defined in order to be successful, however some people simply prefer face-to-face interaction. The courseware caters for the range of social collaboration suggested by participants' in allowing: for facilitated and non-facilitated online discussions; the option of face-to-face meetings throughout the course; and, providing a level of choice when it comes to personal or group communication. Although, it doesn't include times for pre-defined chat sessions, participants' generally believe that the design of these tools within the courseware certainly facilitates the ability for deeper levels of learning to take place. A post-evaluation of the courseware is required to assess if it is successful however, as respondents again point out that it is difficult to confer without processing the actual learning path. Nevertheless, as Particiant_5 (S_E) says, "*So you've got lot of facilities here for conversations, and you've got lots of action. So, I think you've covered the bases pretty well"*

Finally, whilst participants' agree that the existing design ranges from satisfactory to excellent in regards to promoting deep learning, there are two specific suggestions in which improvements may be made. The first suggestion surrounds the design of the resources. Within the course content, the design includes a range of content links and resources, aimed at providing multiple perspectives to the learning content. One Participant_4 (S_E) suggests that providing such a comprehensive list may actually prevent learners' from delving deeper into the subject matter. She suggests scaffolding the content to force learners' to independently research required resources. Participant_5 (S_E) goes further, and suggests that enabling participants to contribute resources to the courseware would built up the identity and value of the 'community of learners', and would be an absolute example of co-construction. He comments says, so "*they can exchange resources, but how is there a way that the resources can be made to the group at a community? If you could do that, that would be a really profound contribution".* Whilst a sub-group of the discussion board provides a space where such resources may be shared, it is clear that the design must go one-step further in integrating this space into the context of the subject topic.

The second suggestion surrounds the way in which deep learning may be enhanced, by altering the questions on the case study. Here, learners' are asked to reflect on whether they have experienced culture shock, 'when, how, and why'. Participant_4 (S_E) points out that the problem with this is that if they haven't experienced culture shock then the question becomes irrelevant. She comments "*if it is not relevant they won't think deep or insightful"*, and suggests altering the wording so that it fits the majority, such as asking "*why is the issue culture shock relevant within Australia?"* because even those whom haven't experienced culture shock, may now see it has meaningful. Thus, the researcher would like to point out the value that the courseware evaluation interviews had, in suggesting ways that the courseware may go even further in facilitating deeper levels of meaning making. These couldn't be pre-empted by the researcher, and ironically have strengthened and refined her courseware design skills.

(iv) Other Aspects of Learning Design

In the final sub-theme of this section, the researcher would like to bring up two issues: the first surrounds the courseware's activities, and the second surrounds designing for students for whom English is a Second Language. These issues have been incorporated within the same section, due to their brevity, and the fact that although only a few persons commented the researcher considered their feedback to be highly relevant and potentially important areas for further research. When it comes to the design of the activities there were three main responses, each representing a different perspective according to the participants' occupation. The prototype of the activities page included a list of example activities, such as

'drag and drop' or 'click to reveal', which are aimed at either lower order thinking skills (recall) or higher order thinking skills (decision making, interpretation). Each of the activity screens corresponded with a course content screen. The intention was to provide students' with a 'fun/active' way in which they may cover some of the course content, and to assess whether the inclusion of rote-learning activities were considered beneficial by students. The feedback from three students tends to indicates that the inclusion of interactive games and simulations strongly contribute to their self-motivation and engagement within the courseware, even if they're generally not 'into games'. Furthermore, they also indicate their support for activities embedded within the course content that enforce rote learning, such as multiple-choice questions that which test students' ability to recall.

For instance, Participant_4 (S_E) believes that the activity screens should be linked within the course content screens, rather than as a separate component. Whilst she supports the constructivistic elements of the courseware, such as the opportunity for personal reflection and the ability for co-construction to create new meanings via social networking, she also thinks that the inclusion of self-test activities adds an interactive element to the courseware that is both fun and motivating. That is, she indicates that those design elements based on behaviourist and constructivistic tenets, can fit together and complement each other within Higher Education courseware. Here, the games aimed at low level recall can provide an element of 'edutainment' that engages the learner, whilst the other design elements scaffold learners' towards a deeper and higher order thinking approach. For instance, this respondent supports the use of games, and suggests the courseware add even more:

> *"If I lose my interest I won't continue, so no motivation to look at other things there […] um, maybe you can add more activities there. Like, we can find out the answer, but within several seconds, done! Rather than, like you have the question, it is all right, but maybe some people are a bit lazy to think. Maybe it takes a long time and they does not really want to do it […] I think it is a good idea if you put [games] there. Because some people, they like very straightforward things".*

In addition for instance, Participant_10 (S_OD) believes that activities are even more important than the inclusion of email or discussion boards, because they're fun, and students are able to access feedback straight away. He comments "*In my opinion I think the activities will be better […] if there is email, it may be slow, but if everyone participants in the activities it will be better and they will have fun"*. When it comes to the issue of 'fun' however, not all students agree that this will be motivating for the majority. Participant_5 (S_E) believes that the message 'fun' may detract some 'rationale' people, *"who does not identify between learning and fun"*, and whom are more strongly motivated by problem-solving. Nevertheless, he also suggests that it is possible to design for both 'fun and the rationale as long as *'it is possible for people to make a choice'.* Whilst the courseware attempts to achieve this, a

post-evaluation is required in order to assess whether it is successful. As Participant_10 (S_E) says *"it is a real challenge for any courseware to do that".*

Web_Participant_7 (ID, USA) also suggests that the learning should be driven by the problem. His feedback however, falls in contrast to other participants, and tends to contradict the perspective of students in particular. Students' strongly support the inclusion rote learning activities, the control afforded them over the interface, and believe the courseware's assignments (which make up 100% of the courseware) are engaging as they're problem-based, and scaffold them towards independent enquiry, and higher order thinking skills. In short, the feedback tends to indicate that the researcher has been successful in catering to both fun and problem-solving, and that that the pedagogical approach has bee effective. This professional's feedback warns against the inclusion of the rote-learning activity, suggests a redesign, which takes away the learner's control over the interface, and does not see how the assignments act as 'problems', which drive a deeper learning approach. He comments:

> *"The activities are suspect. One is a rote knowledge exercise, and I'm strongly against tarted-up drill and kill. The other seems more useful, but the 'drag and drop' seems gratuitous, when a branching scenario seems to make more succeed. Why not have the latter be the main activity, and write it in such a way if they does not have the knowledge, they can't succeed (e.g. Van Merrienboer). Then they're driven by the problem? […] Overall, there really seems nothing new here. It is got content, activities, lectures, assignments, discussion boards, all the usual suspects, with no clear new input. How's this constructivist?"*

Worryingly, this professional focuses more on the inclusion of components of the courseware, as opposed to how these can be used in order to deliver a design embedded in a philosophical approach. Finally, whilst academics were generally quiet concerning the design of the activities, Participant_ (A_E) expressed his concern regarding the development would have on a lecturer's already busy timetable. He asks "*can you quantify the added value I would get from implementing the game*?" He then points out that whilst the multimedia elements are a strength of the courseware, expecting academics to include interactive activities may be a significant impost on their time. His desire to develop the activities would be driven by two things. Firstly, the ease in which development can occur such as the inclusion of reusable objects. Secondly, the existence of research that would quantify that he would get twice as many students by including the extra section. He says, "*If you can show me I will get double the number of students by having an alternative learning activity that's fine".*

Unfortunately, the decision not to include these activities due to quantifiable reasons (development time and effort/ increase in student numbers), may outstrip the potential benefits to students' learning – including a higher level of engagement and self-motivation

within the courseware, and the possibility that these features contribute to maintaining course attrition levels. It is clear that within a real-world situation it is clear that academics' require significantly more support when it comes to developing and maintaining courseware, and that further research is required in order to explicate the benefits of both games-based activities and constructivistic design elements. This leads the issue of designing for learners' for whom English is their Second Language (ESL). Four ESL participants evaluated the courseware. Generally, their feedback matched those of other respondents, however it is clear that a few struggled with the overly colloquial use of language. One participant suggested the inclusion of a link to a language translation tool, whilst another commented that the multimedia elements would act as an effective learning aid for ESL students. Thus, a careful reading of the courseware is required to ensure its jargon doesn't unnecessarily confuse ESL learners'.

6.4 Discussion

This chapter has presented the analysis of the open-ended questionnaire data. This provided information on some of the strengths, requirements and concerns on teaching and learning online, the strengths and concerns on user-friendly design, the requirements on learner-friendly design, and a divergence of opinions on the learning design. In some cases the analysis provided another perspective on a sub-theme from the quantitative analysis. For example, within the quantitative chapter aesthetics was found to be important for learner motivation. This chapter provided further information on this subject, as research participants pointed out that generally, 'bright colours' as opposed to 'steroid black and white' backgrounds specifically contributed to increase learner motivation in using courseware. On the other hand, overly bright backgrounds may impact upon participants' ability to learn if it caused visual fatigue or prevented the respondent from reading off the screen. In other cases, the open-ended questionnaire data presented new sub-themes and issues, which the statistical component alone cannot address. For example, within the theme of user-friendly design an emerging sub-theme included the Learning Management System (LMS). Participants' found that the design functionality of their LMS negatively influenced their learning experience.

The chapter also presented an evaluation of the prototype courseware, whose design was discussed within Chapter Four. In short, the courseware was designed and developed based on the researcher's interpretation of contemporary literature and practices on teaching and learning online. In particular, the learner-friendly design was based strongly on a learner-centered constructivist-oriented methodology. The intention was to hopefully obtain feedback specific to a constructivist-oriented methodology. A design assumption was that the courseware was user-friendly (ongoing semi-structured pilot tests of the courseware to help ensure this). There were two tools used for the data analysis, which is the face-to-face interview data and the web-based participants' data, which stem from email sent to the

researcher. The analysis found that some of the findings from the questionnaire data were supported, whilst other findings provided a different interpretation of the questionnaire data. For example, the researcher found that that in general, participants strongly supported the bright colour scheme utilised by the courseware, and point out that it contributed to a sense of engagement within the online environment.

On the other hand, whilst the questionnaire data indicated that participants' support open-ended navigational environments, many of the participants had trouble with the highly flexible and open-ended environment. They suggested a range of ways in which the problems (such as wayfinding) may be addressed, such as a redesign of the screen design and layout to include a visual site map. On a final note, the analysis also found that in some cases the findings from this researcher contrasted to the literature and/or practices on courseware design. For example, traditional heuristics suggest that the colour schemes utilised within virtual environments map to their pre-defined fields. Generally within the field of Higher Education and professional training environments muted colours of blue and green for instance, are usually suggested. As discussed above, the findings from this research suggest that participants in this research may consider muted colours somewhat unengaging. This component of the chapter will provide a discussion of the qualitative findings. The discussion will be divided into the three themes of teaching and learning online, user-friendly design, and learner-friendly design (which will encompass feedback on behaviourist and constructivist-oriented design). Each of the research questions detailed in Chapter Three relating to these sub-themes will be listed, before a discussion addressing these questions will be presented. Following this will be the Conclusion of this chapter.

6.4.1 Teaching and Learning Online

What are some of the strengths, requirements and concerns on teaching and learning online?

How do contemporary students, academics and professionals define courseware?

6.4.1.1 Perceived Strengths, Requirements and Concerns

Participants' view the strength of courseware as a pre-designed learning aid that connects them to the instructor as well as other learners'. This sense of being 'connected' and the convenience of 'connecting' to learning aids with relative quickness may be why these respondents' appear not to have a negative perspective of teaching and learning online. Not surprisingly, participants' require courseware that is highly interactive and connects them synchronously and asynchronously to both the instructor and their peers. There are varying interpretations of what they define to be 'interactive' however, and this may be because courseware is a relatively new phenomenon within the scope of Higher Education, and the uptake of eLearning appears to be relatively slow according to these participants. There is

agreement however, that ‘interactivity’ often occurs synchronous or asynchronous communication between peers or between the learner and instructor. There are however some participants’ whom criticise asynchronous interaction. In particular, they find that feedback from discussion boards and email may be too slow or even ineffective. This may be why participants’ are supportive but not highly supportive of discussion boards within the quantitative findings. There is much more support of synchronous interaction, such as the use of chat and interactive video/voice streaming, and much of this support comes from students, and from academics from Education – whom were the most supportive of chat within the quantitative findings. Although many participants are supportive of collaborative tools however, they are much more supportive of using tools to support a teacher-student relationship, as opposed to a peer-to-peer relationship. This may be because not all learners are deep learners, and many orient towards a strategic learning approach, and are more concerned with self-testing and obtaining the instructor’s feedback to assess how well their learning is progressing.

The qualitative data shows an overwhelming consensus between participants for more effective user-friendly and learner-friendly design. The need for more effective design may be explained by academics’ concern on the extra workload associated with web-development, and their perceived hesitation towards innovation. Academics in this study indicate a trend towards conforming to traditional design guidelines, and tend to be unsure about whether to innovate. This is strongly influenced by their perception that there is a lack of research on courseware design. Thus they are somewhat unconvinced that implementing specific design features such as ‘engaging games-based activities’ would be worth their while. One participant (A_E) in particular wanted to know whether implementing games-based activities would contribute to increased student numbers. Participants agree poor design is a basic concern on teaching and learning online. Again, the existence of poor design may be influenced by the perceived lack of institution support academics have in terms of both time and cost. The relativeness of the technology means that academics may be unsure of how to design for online environment. Finally, it may be that academics and instructional designers are not pursuing a learner-centered methodology, which addresses learners’ needs. This is suggested in the qualitative results by students’ complaints that they are not consulted when it comes to the learning design. Thus, their learning needs are not being met.

Participants’ strongly require courseware that is well-designed. Feedback suggests that a lack of user-friendly and learner-friendly design negatively influences participants’ level of engagement with the courseware. Likewise, feedback from the qualitative data also suggests that effective user-friendly and learner-friendly design positively influences learners’ motivation. As mentioned, user-friendly design appeared to significantly impact upon the ability for lecturers’ to effectively teach online, and learners to effectively learn online. When it

comes to user-friendly design, there is a range of issues that participants' bought to the researcher's attention, furthermore, a large proportion of the feedback centered on the user-friendly design. This may be because there is still a gap in the literature and practice on a set of agreed-upon design heuristics for web-based learning. It was evident to the researcher that the user-friendly design significantly impacted upon participants' sense of well-being with the online environment, their ability to wayfind, and their ability to access learning material. Participants' are specifically concerned specifically about poor screen design and layout, navigation issues, slow download times, and issues associated with using a Learning Management System (LMS). This may be because these issues specifically affect their learning experience within their own real-world situations.

Interestingly, there was general agreement from participants in both the open-ended questionnaire data and courseware evaluation that the aesthetics of courseware should include bright 'happy colours', that does not visually fatigue the learner. Students in particular were concerned about 'boring' colours, which negatively influence their perception of courseware. This may also be because students need extra motivation in maintaining their motivation within online environments, because of the perceived 'impersonal' nature of working with a computer. This perspective goes against traditional web heuristics, however it is indicative of how some aspects of traditional user-friendly design may need to be altered for learning environments. The statistical questionnaire data suggests that participants' required both direct navigational guidance and an open-ended navigational structure. Feedback from the open-ended questionnaire data also suggests that participants' like to have a strong level of user/learner control over the interface, whilst also having the option of being guided navigationally. Nevertheless, in practice it appeared that a highly open-ended courseware design tended to be disorienting to a number of participants. This may be because theoretically participants' support open-ended navigation, but within a real-world situation which involves learning, they prefer to be a stronger element of instructional guidance.

Although the researcher included a range of navigational aids and direction, these appeared to be insufficient for learners', who were guided strongly by the screen design and layout. Participants' liked the element of user-learner control over the interface, and one participant in particular was in favour with the open-ended nature of the navigation, however most suggest that the researcher redesign the screen design and layout. There were varied opinions in regards to how this may be achieved. This may be because participants' were unsure how the screen design and layout needed to be altered, without using a redesigned prototype to confirm their conceptualisations. A few participants suggested that the researcher minimise the number of navigational aids, however other participants suggested the existing aids were effective. Two participants were strongly in favour of a visual site map,

which informs learners of where they are and where they have been. When it comes to learner-friendly design, there was less feedback and it was more varied. This may be because each participant learns differently, and his or her feedback reflects this. It could be that rather than subscribing to a particular learning theory, participants appropriate a range of theories and methodologies to suit their approach to learning. There is however three issues relating to the learner-friendly design which participants generally agree on. Participants are concerned about information and graphics that doesn't match the instructional sequence, low levels of interactivity, and when the learning is not designed according to the online medium. This suggests a strongly link between the user-friendly design and learner-friendly design, so that each impact upon the other. For instance, respondents request graphics that do not visually fatigue their eyes, but they also indicate that the type of graphic needs to be appropriate to the learning content.

In general the open-ended questionnaire data indicated many more concerns on teaching and learning online, compared to strengths or requirements. This may be because although participants' are relatively supportive of the concept of teaching and learning online, they could find that the execution of its design within real-world situations does not fully meet their learning needs. There are five concerns in particular, which are bought up in the qualitative data, and all concerns are emerging sub-themes. Firstly, participants' are worried that the nature of learning online is 'impersonal', and strongly believe a face-to-face component to teaching and learning online should be maintained. This is a particularly strong theme within both the questionnaire and courseware evaluation data. The need to maintain a face-to-face element tends to emphasise the need for learning to be both social and personal. It may be that for some people fully-online courseware can only go so far in engaging learners, despite how well it is designed, and that computers cannot adequately replace face-to-face learning alone. This is supported within the courseware evaluation, as several participants point out that the option face-to-face meetings are essential for instructing and engaging learners. In another example, it may be that fully-online learning environments are better suited to a particular learning style, and its focus on independent learning may be inadequate for those learners whom require more personalised attention. For instance some participants point out that they are 'highly social' learners, and their learning style is better suited to face-to-face instruction. One participant in particular, pointed out that she needs a face-to-face environment to maintain her learner motivation. She comments that she is not an independent learner, and needs the type of social environment only available in face-to-face environments to maintain her motivation.

The second concern that participants have is related specifically to academics and those involved in courseware development. They point out that designing, maintaining, and facilitating courseware is time consuming and costly, particularly compared to face-to-face

learning. This may be because of a perceived lack of support associated with teaching and learning online when it comes to developing courseware. For instance one academic in particular resents the time developing courseware takes away from her personal and research time, and comments that she feels somewhat unsupported by the university in developing courseware. It may also be because they are inadequately trained for teaching and learning online, and unaware of the processes and methodologies that may contribute to improving both the time and cost associated with courseware development. For instance, one academic is clearly unacquainted with synchronous technology as he points out that 'so much information is lost' within asynchronous online communication, and implies that we need to find and/or develop software that better mimics face-to-face tutorials. The issue of time and cost appears to have a significant impact upon the design of virtual learning environments. For instance, one instructional designer is unconvinced that collaborative learning tools are useful, and suggests that a study could be undertaken to assess the cost-effectiveness of face-to-face learning versus online communication. Despite the research supporting collaborative learning, this feedback tends to imply that some designers are somewhat against innovating unless it is justified in terms of time and cost. This perception may be at the cost of designing effective learning environments.

The third concern relating to teaching and learning online is that courseware is pedagogically ineffective. This may be because participants' tend to perceive contemporary courseware as poorly designed. Likewise, the design of courseware may be heavily influenced by the time and cost it takes to develop, and the perceived lack of support when it comes to teaching and learning online. Another reason courseware may be pedagogically ineffective, is that some participants' may have developed a phobia against online learning either due to the perceived unreliability of the technology, or because their learning style preferences a face-to-face mode of communication. On the other hand, the fourth concern relating to courseware relates specifically to students whom are supportive of online learning. They believe that there should be increased use and promotion of courseware by academics. The perceived lack of academic use and promotion of courseware is again, probably related to the academics' belief that developing courseware may not be worth their while in terms of the time and lack of institutional support. On the other hand, it may be that some academics, like students, preference a face-to-face mode of learning and are uninterested with new technology. Finally, the last concern relating to teaching and learning online refers specifically to participants whom are over 50. They perceive teaching and learning to be problematic due to the ergonomic nature of 'sitting in front of a computer', which they argue has a negative effect on their joints. This viewpoint may be informed by the preference some participants have for face-to-face learning. On the other hand, it may be that these participants' are not looking after their bodies effectively, by taking regular breaks and stretching their bodies. It may be that like some academics, many learners are ineffectively

trained for using web technology effectively. This includes taking breaks after 45 minutes for instance – depending on the individuals' attention span, which is the general amount of time a person can focus at length.

6.4.1.2 Definition of Courseware

Participants' generally agree courseware should provide digital resources to help students learn a particular subject, but there are a trajectory of opinions on what this means in practice, particularly on the issues of design, collaboration, and interaction. The belief that learning should be at the core of courseware design emphasises an important difference between general web sites and those aimed at teaching and learning online. Some participants however were unsure of how to define courseware. These participants were somewhat unfamiliar with teaching and learning online. This tends to emphasise the relatively slow integration of teaching and learning online within some areas of contemporary Higher Education practices. Some participants believe that courseware should be more than 'information dumps' which simply provide resources for learning. These participants see courseware as something that is pre-designed, interactive, and based on an instructional methodology, where much of the learning can take place. Others offered a more pragmatic and open-ended perspective. They believe that courseware may a myriad of things, as long as it supports teaching and learning in some way. They believe that it is not necessarily pre-designed, and that it doesn't necessarily include interactive activities, collaboration with other learners, or contact with the lecture. In discussing what courseware means, a couple of students also explicate a desire for a level of face-to-face contact to be maintained. They believe face-to-face element of 'social networking' is essential for maintaining their motivation, and that it provides a supportive framework for building a 'community of learners' where information is shared and discussed. The difference of opinion shows that participants' believe courseware may be supplementary, web-dependent, or fully-online, however it also emphasises a dislike for fully-online courseware. This may be because as previously stated participants' believe courseware cannot adequately replace face-to-face communication.

When asked to define courseware in the face-to-face interview, there are slightly differences of opinion when it comes to the instructional methodology on courseware design, between students from Other Disciplines and students from Education. This may be because students from Education are more in-tune with instructional methodologies, and are more likely to regurgitate and support beliefs from contemporary literature. Students from Other Disciplines give the impression that courseware should be strongly teacher-centered, where the teacher controls the objectives, content, and results. Students from Education however, are less focused on whether courseware should be teacher-centered or learner-centered. One student from Education points out the complexities in designing courseware for learning, and refers to Vygotsky's Zone of Proximal Development. Interestingly, every student pointed out

the need for courseware to enable student-teacher collaboration. The student above in particular, believes it is impossible for students to reach their optimal levels of learning without this relationship. In courseware he sees this as an interactive process where students' develop a personal relationship with the lecturer/tutor. This emphasises the need to access and maintain a personal relationship with the instructor, for teaching and learning online to be effective.

When it comes to student-student collaboration, students offer slightly differing perspectives to some of the literature supporting social constructivist methodologies. When students explicated the need for student-teacher collaboration, the researcher asked them whether courseware should necessarily enable student-student collaboration via the use of email, discussion boards, or chat for example. Their feedback showed that for some students this wasn't something they required or expected from courseware. Other students disagree, and believe that facilitating peer collaboration is essential for courseware. This emphasises the need to design flexible learning environments that support a myriad of learning preferences. It may be that researcher's intention to facilitate and encourage social networking between peers relies strongly upon the peer group at the time. This may be why some discussion board groups are effective during one semester, whilst they are not used in another semester. It could be that forcing peer-to-peer collaboration may negatively influence some learners' motivation. For instance, one academic points out that he disliked being forced to collaborate with peers when he used courseware as a student. Finally, students generally agree that courseware should include activities – whether they are based on recall or construction. A couple of students in particular indicate that games based can be motivate and engage students online. For instance, Participant_10 (S_OD) believes that activities are preferable to asynchronous collaborative tools, because of their perceived synchronicity in providing instant feedback. The support of both activities aimed at low levels and higher levels of learning for learner engagement, potentially indicates that both behaviourist and constructivist tenets may be able to coincide hand-in-hand within courseware. For instance, one participant from Education strongly supported the use of self-test activities aimed at lower order thinking (as long as they provided adequate feedback quickly), for engaging their motivation. On the other hand, they also supported the inclusion of the Constructivist Learning Environment (CLE) activities within the courseware, for engaging their motivation through reflective, active, and intentional learning.

6.4.2 User-Friendly Design

What are some of the requirements and concerns on user-friendly courseware design?

What are participants' attitudes to the user-friendly design of the prototype courseware evaluated in this study?

Does the theory and practice on courseware design translate effectively into practice, when it comes to the courseware evaluated in this study?

6.4.2.1 Requirements and Concerns

Participants' feedback concerning the user-friendly design of courseware made up a large proportion of overall data generated from both the open-ended questionnaire and courseware evaluation. This may be because there is still a large gap in the research concerning user-friendly design for courseware, and this is reflected in designs that are somewhat user-unfriendly for teaching and learning online. The data indicates a strong link between user-friendly design and learner-friendly design. For instance, technical problems, poor screen design and layout, and poor navigation all have an adverse affect on participants' perception of teaching and learning online, and their ability to access and download learning resources. The perceived 'user-friendliness' of the courseware prototype, for instance the colour scheme and inclusion of help tools such as the First Time Tutorial positively influences respondents' connection with the courseware. On the other hand, the somewhat busy screen design and layout impacted upon participants' ability to wayfind effectively. The learner-friendly design also tends to influence the user-friendly design. For instance, behaviourist strategies tend to focus on linear navigational routes, whereas constructivist-oriented strategies tend to focus on non-linear navigational routes. The feedback indicates however, that participants have a diversity of opinions when it comes to their preferred navigational design. This tends to suggest the need for adaptable learning environments, which incorporates both non-linear and linear (open-endedness and instruction) navigational routes. Thus, it could be said that both behaviourist and constructivist-oriented strategies need to be considered when it comes to effective learner-centered design.

This leads us into our first requirement for user-friendly design of effective information organisation and flexible learner control. Participants believe information should be well-organised into components, such as 'lectures' or 'tutorials', and that this information should be easy to access. They also believe however, that courseware should be flexible to their needs, so that they can access 'what they want', 'when they want' with ease. This introduces a potential problem for one academic from Other Disciplines however, who tends to apply a teacher-centric methodology to her teaching approach. She points out that online students constantly want to access material which will be covered at the end of the course however she believes it is important that they does not access this material too early because of the potential issues of cognitively overloading them with excess learning materials. The perceived opposition to this perspective by some students in this study tends to suggest that learners' need to be given the opportunity to choose whether they want to access these learning materials early or not.

Another requirement for the user-friendly design is the inclusion of more visual elements, such as graphics in replacement of text, and more multimedia objects such as sound, videos, and slide presentations. There appears to be a strong relationship here between the user-friendly design and the learner-friendly design. For instance, in the questionnaire data respondents indicate that 'long blocks of texts' negatively influences their learning motivation, and instead suggest 'appropriate graphics' replace the text-blocks. The emphasis on graphics and multimedia objects to be relevant to the learning shows how the user-friendly design needs to be learner-centric. Within the courseware evaluation, the inclusion of multimedia elements was considered one of its strengths, and some respondents linked these elements with mapping to a range of learning styles. There appeared to be a strong relationship between the inclusion of multimedia objects and participants' high levels of engagement with the courseware. It should be pointed out however, that not all participants were fully supportive of the inclusion of multimedia objects. One participant pointed out that he wasn't sure whether the multimedia elements would be utilised by students in a real-world situation. Thus whilst a pre-emptive analysis suggests that the inclusion of multimedia is essential in courseware, ongoing and post-evaluation of a real-world courseware by students would better assess how effective multimedia elements are in addressing different learning styles. Another issue that arose from the inclusion of multimedia elements stemmed from those involved in producing courseware. They pointed out the extra time and cost involved in designing and implementing multimedia, and want a 'guarantee' that it would be worth their while in terms of students' learning.

Another requirement for courseware is enhanced usability and ICT support for both students and academics in Higher Education. This may be because existing courseware tends continues to have usability issues, which could be why courseware is considered technologically unreliable. The three most common usability aids participants' suggest are a Help section where they are able to access technical help (either to content or to a technical help person via email or phone for instance), a site map, and a search engine. Although the courseware included a site map, participants' suggested that it be redesigned to include a more visual understanding of 'where they've been' and 'where they've got to go'. This is another example of how traditional user-friendly design may need to be altered for a teaching environment. Not all participants' agreed that they would use a search engine, however those that did indicated that it would need to be designed so that relevant search results come up. They are particularly concerned about search engines that provide irrelevant results. The perceived ineffectiveness of existing search engines could occur because participants' are not trained to use them, and because developers have not developed a 'search friendly' tool. A few participants also suggested that pedagogical aids could help their usability, and other participants suggest that the collaborative tools could be used for

students to provide peer-networking and ICT support to each other. This emphasises the need for courseware to cater to a more personalised approach. Within the courseware evaluation the inclusion of the First Time Tutorial was strongly recommended by participants, whom pointed out that it was an essential component for scaffolding the teaching and learning online process. They believed that it aided their usability, and helped them become more familiar with the courseware. They also pointed out that its simple design and ease of access helped foster a sense of 'wellbeing' with their virtual environment. On the other hand, one participant was concerned that over-relying on the tutorial was potentially dangerous because it was text-based, and users' tended to skim read text online. This may be why participants' agree that the tutorials accessibility through the Help menu was essential.

Participants require effective screen design and layout, attractive aesthetics, and well-designed navigation. Much of the feedback centered on the inclusion of these elements in particular, and there were a range of opinions. Screen design and layout is one of the most important elements of courseware design, according to the research participants, and poor screen design and layout appears to have a negative influence on participants' engagement with the courseware. This may be because the virtual environment affects learners in a similar way that the physical environment does. So, that whilst air conditioning, proper equipment and lighting may affect participants' physical wellbeing, screen design and layout affects their metaphysical wellbeing. There is a strong consensus that good screen design and layout should include uncluttered layouts, an appealing aesthetic, and a preference for graphics over text, small text boxes to enhance usability, and features that ensure navigational and informational elements are easy to find. Conversely there is a strong dislike for busy cluttered layouts. This was particularly evident with the courseware evaluation, as participants' perceived the design of the Homepage to be 'too busy', and this appeared to affect their ability to navigate the courseware effectively. There is a strong requirement for attractive aesthetics, and a dislike for aesthetics that are 'dull and boring'. Colourful aesthetics that are well-designed appear to positively influence learners' motivation. This is supported within the evaluation of the courseware prototype, as most participants supported the colourful design and linked this to their sense of engagement with the courseware. Nevertheless, there were some problems with the contrasts of the hyperlink colours to the screen backgrounds in the First Time Tutorial, which emphasises how colour can influence usability.

Another example of how screen design and layout affects usability within the courseware prototype is the way in which the design of the menu box was somewhat confusing to respondents. Whilst respondents generally agreed the inclusion of multimedia elements was important, the busy screen design and layout of the Homepage influenced their understanding of the functionality of the menu box, and thus their ability to download

resources. Most suggest a more simplified redesign of the Homepage's screen design and layout for enhanced usability. A few suggested a visual site map, as mentioned earlier in this section. When it came to the design of the navigation there were a myriad of responses. Most participants' agree 'good navigational design' is important, however they are vague when it came to expressing what this is. This may be because they are unsure themselves, and need an example of multiple navigational methods to specify what they regard as 'effective'. There appeared to be division in the open-ended questionnaire responses, as some participants' supported unstructured and open-ended navigation, some disliked linear navigation, whilst others preferred a mixture of both open-endedness and direction. The courseware evaluation showed that in practice, most participants preferred a high level of direction, and liked the linear design of the First Time Tutorial. This may be because they also had the option of moving flexibly through the courseware, and going 'where they wanted' 'any time they wanted'. Many participants were overwhelmed by the open-endedness of the courseware, and in theory pointed out that they would refer to the navigational aids if they were using the courseware in a real world situation. Nevertheless, it is difficult to assess how effectively the navigational tools would be, without performing ongoing and post-evaluation of the courseware in practice.

There are four specific concerns relating to the user-friendly design, within the qualitative data. These include concerns on being inconvenienced by the courseware, technical problems, accessibility issues, and problems with the design of learning management systems (LMS). The quantitative results demonstrate that respondents generally agree that courseware should utilise effective usability, such as clear navigation, good screen design, and help menus. The qualitative results support these finding, and provide a greater level of understanding in regards to specific usability features that are concerning. Like other aspects of user-friendly design, a high percentage of participants' had a complaint regarding the inconvenience of courseware. This may be because the design of courseware tends to focus on either the user-friendly design or the learner-friendly design, at the expense of either usability or learning. There is a very strong consensus that pop-ups, long downloads, and issues related to hyperlinks are inconvenience participants. Technical problems associated with courseware have a strong influence on usability, and may help explain why courseware is considered pedagogically ineffective and unreliable in terms of the software and hardware. There are three specific technical problems that concern participants: if *"If the systems is always down ie bad server"* (S_OD)*;* technical constraints associated with LMS e.g. lack of drag and drop functionality; and, compatibility issues with the OS (Mac/Windows OS, accessibility from home office system). These features all affect the successful application of teaching and learning online.

There is a shared concern amongst participants about the difficulty in reading text online, due to font sizes or bright screen colours. There is also a shared concern about what one participant (S_E) calls *"Downloads being compatible etc".* There is however some conflicting thoughts in regards to what participants perceive as compatible (pdf vs word), within the open-ended questionnaire data. Within the evaluation of the courseware prototype participants strongly supported the inclusion of multiple forms of downloads (e.g. html, word, and pdf documents for text). Several participants believed that accessibility was a strength of the courseware design, and liked the fact that they could work flexibly by accessing material in their preferred medium and moving away from the computer if required. Nevertheless, those involved in developing courseware were concerned about the time it would take to develop and access the accessible materials. When it came to accessibility, participants' strongly supported the ability to work offline, and believed that this would improve the courseware's usability. On the other hand there was an additional suggestion that the downloads should all be accessible from the same page, to improve both accessibility and usability. Finally, there is a shared concern amongst participants about the user-friendliness of contemporary learning management systems. The main concern on LMSs is the perceived limitations on the interface and navigational design, particularly by students from Other Disciplines (e.g. interface and navigation design). The problems associated with LMS may be partially due to the lack of training, time and support of academics in web development. On the other hand, further investigation of this issue is required in order to assess which problems are down to the design of the LMS, and which are due to the effective use of the LMS.

6.4.2.2 General Comments: Prototype Courseware Evaluation

Some of the participants' attitudes to the user-friendliness of the prototype courseware have been investigated in the section above. In the face-to-face interviews participants were asked four open-ended questions on the courseware's 'user-friendly design', the use of 'usability aids', the 'visual design', and the provision of a multimedia mix of text/audio/graphics to welcome students to the site and deliver basic course content. The initial intention of the researcher was to outline the feedback for each of the questions linearly, however this proved to be problematic. Upon analysing the interview data, it became apparent that the data is best described as a 'matrix', where there is a high level of interactivity between each of the questions. For instance, the visual design strongly affected the usability of the courseware, and the usability of the courseware was affected by the design of the multimedia elements. Turning to the feedback from web-based participants, she found that much surrounded the user-friendly design. Excluding on instructional designer, the user-friendly design appeared to be the courseware's strength for this web-based group. Participants' approached evaluation from primary perspective of learner. This appeared to be particularly difficult for academics, which pointed out need to actually 'work as a learner through the

courseware' in order for their evaluation to be most effective. Thus feedback thus far is preliminary.

The initial response from the range of participants is that the courseware is relatively user-friendly. Nevertheless, it is difficult to divide the feedback into perceived 'strengths' and 'weaknesses', because the discussion of nearly every component necessitated a trajectory of opinions. For instance, the aesthetic design of courseware was considered one of its strengths, however one academic from Other Disciplines points out that the colours were non-traditional and he was unsure of how successful they would be in a real-world situation to learners. There's a strong relationship between user-friendly and learner-friendly design, as most participants provided in-depth detail regarding how the user-friendly design impacted upon their use of the courseware as a learner. For instance, some participants' pointed out that the ability to access the learning materials in a range of formats positively influenced their perception of the courseware. They also believed it would enhance their ability to learn, by enabling them to work away from the online medium. This may be considered positive, because participants' tend to regard online learning as somewhat impersonal, technically unreliable, and user-unfriendly because of this.

The researcher found that the theory on the user-friendly design of courseware generally translated effectively. For instance, the need for simple uncluttered screen design, clear navigational routes, and usability aids. Nevertheless, it was clear that the user-friendly design had a strong impact upon the ability to engage learners online, and in some cases traditional user-friendly design did not necessarily apply. For instance, traditional user-friendly design of the aesthetics for an education or training genre generally specifies muted colours of blue or greens for example. In practice, the inclusion of bright 'non-traditional colours' within the courseware prototype went a long way towards motivating learners online, and many considered it an important aspect to maintaining their sense of 'fun' and engagement with the courseware. In some cases, traditional user-friendly design applied effectively, but impacted upon learnability as opposed to just usability. For example, the inclusion of a First Time tutorial positively influenced the usability of the courseware. Nevertheless, it also had a positive impact upon participants' sense of wellbeing, as they felt supported and therefore believed that they were better prepared to use the online environment as learners. In some cases, there were emerging themes that the researcher had not come across in the literature, which impacted upon the user-friendly design for eLearning.

For example, the impact of downloads upon learners' appears to be undocumented. This may be due to the relative newness of the field of user-friendly design for eLearning. Participants' are highly concerned with long downloads, and downloads which time-out. This negatively influences their perception of courseware, and may be a reason why they

consider courseware to be unreliable and pedagogically ineffective. It may also be why there is such a strong preference for the multimedia downloads to be more accessible within the courseware prototype, and why the option to work offline was positively received by participants. Finally, it should be pointed out that the main issue for the researcher however, was implementing these design features effectively. Although she did a pilot test of the courseware to ensure it was relatively user-friendly, it was clear that the design and development of the courseware could have been improved. For instance, participants complained about the unprofessional graphics (such as cartoons), which the researcher downloaded from publicly available clip-art. In some cases the researcher's interpretation of the theory tended to be applied ineffectively. For example, she attempted to apply the screen design principles of 'consistency, and balance', however feedback from the interviews suggests that these were two of the biggest problems with the courseware's interface design. In particular, the multimedia box on the Homepage dominated the screen, so that it was unclear how to use it effectively. A post-evaluation of the courseware from a learners' perspective was clearly required, in order for the design to be wholly user-friendly. Furthermore, web development support would also go a long way towards improving the execution of the user-friendly design.

6.4.3 Learner-Friendly Design (incorporating behaviourist and constructivist-oriented designs)

What are some of the requirements and concerns on learner-friendly courseware design? What are some of the requirements and concerns on designs based on behaviourist and constructivist philosophies?

What are participants' attitudes to the learner-friendly design of the prototype courseware evaluated in this study?

Does the theory and practice on courseware design translate effectively into practice, when it comes to the courseware evaluated in this study?

6.4.2.1 Requirements and Concerns

The qualitative data on learner-friendly design incorporated less than 40% of the overall feedback. It appears that participants', particularly students, are much more concerned with the user-friendly design of courseware, and more vocal in regards to how these features influenced their learning experience. This may be because contemporary courseware tends to be perceived as user-unfriendly, and this significantly affects learners' ability to learn online. It may be that poor user-friendly design negatively impacts upon participants' ability to effectively utilise courseware for learning, thus they may be less vocal about the learning design. Interestingly, the opinion of professionals often conflicted with those of other participants. For example, students in this study tend to be strongly supportive of games-based activities that test both lower order thinking and higher order thinking, as long as they

provide quick and relevant feedback. Within the courseware evaluations several students appeared to be very supportive of the activities that encourage lower order thinking skills, and they tended to believe that these activities were an effective form of self-testing, which engaged them as a form of ‘edutainment’. One professional instructional designer however was strongly against the inclusion of rote-based activities that cater to learners’ recall and memorisation skills.

When it came to the learner-friendly design the research participants agree on the importance of designing for learning. This belief however may be compromised by the time and cost constraints imposed upon the development of courseware, the perceived lack of support of academics and designers in developing courseware, and opposition to learner-centered methodologies which are not ‘tried and tested’ to the satisfaction of those involved in producing courseware. This may be because humans tend to be hesitant in supporting new concepts and technologies until they have developed a very familiar understanding of the model in order to feel comfortable. The finding in this study that only 22.8% of participants in this study considered themselves to have ‘much familiarity’ with teaching and learning online, and 32.1% of participants believed themselves to have little or no familiarity with teaching and learning online, indicates that the concept of web-based learning is still new in some areas of Higher Education. An example that supports the researcher’s belief that participants may be hesitant in embracing new technology is implied in the feedback of one instructional designer. This instructional designer was unconvinced of the value of using collaborative tools such as discussion boards and chat, partly because he perceived a lack of research in the area on the effectiveness (including pedagogical and cost effectiveness) of using these tools.

When it comes to learner-friendly design participants’ are particularly concerned with the way motivation may or may not be catered for via teaching and learning online. This may be an indicator that they perceive existing courseware to be somewhat lacking when it comes to engaging their motivation through the learning design. Within the open-ended questionnaire participants tend to be vague in regards to how they define ‘engaging courseware’, and provide a list of open-ended concerns such as ‘dull and boring design’. This may be because they were unsure or not keen to express how they were engaged online. Likewise, many respondents specify a requirement for ‘engaging’ courseware, but provide little information in regards to how they define this. By coding participants’ requirements and concerns on the user-friendly and learner-friendly design however, it is possible to come up with a list of sub-themes that are necessary for effective learning online, and therefore may contribute towards engaging participants. For instance, within the user-friendly design attractive aesthetics were found to be an important element towards engaging learners online. Within the learner-friendly design a requirement for courseware to facilitate a strong instructor-student

relationship through the collaborative tools (and a face-to-face component) is an example of how fostering personalisation online may contribute to engaging both instructors and student.

The analysis of the open-ended courseware evaluation data enabled the researcher to obtain a more specific understanding of which features are considered engaging. In particular, fostering constructive and meaningful learning environments (CLEs) was a strong motivator amongst all interview participants. On the other hand, several students pointed out the value to their sense 'fun' and learning, in including games based activities that are directed at recall and memorisation, in order to test their understanding of the content they've covered. This tends to indicate that both behaviourist and constructive-oriented design features may sit side-by-side within courseware. There are a list of requirements and a divergence of opinions on the sub-themes relating to learner-friendly design. The requirements include: catering to different learning styles; including a variety of resources; including self-tests; facilitating learning and providing effective assessment (monitoring the learning progress); personalising the learning environment; catering to speakers whose second language is English (ESL); and providing constructive learning environments. There is a divergence of opinions on: the educational philosophies utilised within courseware; the level and type of instructional guidance; the concept of deep learning; the mode and purpose of collaboration; and the concept of independent learning. Each of these issues will be discussed below.

Participants in this study require courseware that caters to different learning styles by utilising a variety of media modes. This is supported strongly by the quantitative findings. When it comes to implementing courseware that caters to different learning styles through a range of media however, it is clear in this study that the screen design and layout significantly impacts upon respondents' ability to access a range of media. For the researcher this emphasised the importance of providing an in-depth formal evaluation of the prototype before it is released for use. For instance, in the courseware evaluation participants struggled with using the multimedia and in some cases weren't aware of the full functionality of the tool provided. Although the researcher conducted ongoing informal evaluation of the prototype courseware whilst it was in development, it was clearly inadequate in fully assessing the courseware's usability. Whilst participants point out that one of the strengths of the courseware is its ability to cater to different learning styles, those involved in development comment on the time and cost involved in its development. This emphasises the need for more support in developing courseware, within Higher Education. Participants in this study also require courseware that provides a range of resources. Furthermore, the inclusion of resources is linked to the ability of learners to pursue deeper and more independent learning. This may be because providing a range of resources enables learners' to pursue material that is meaningful and of interest to them, and this in turn encouraging them to become more independent. The inclusion of too many resources was viewed by one student as discouraging active learners, as she believed

learners should be encouraged to find information themselves and not have it ‘provided on a platter’ to them. When it comes to the use of resources in aiding deep learning, another participant pointed out that providing an opportunity for participants to share resources online would go a long way towards both encouraging deep learning through social collaboration.

Respondents strongly support the inclusion of self-tests. This may be because they found it an effective form of monitoring their learning progress. For instance, a couple of respondents from the courseware interviews pointed out that it would be helpful to include a self-test after every section of the courseware, so that they could monitor their learning progress. When it comes to self-tests students request a range of tests, such as multiple-choice, and short answer questions. Their requirement for both however, is that they are provided with effective and timely feedback. There were a few students against multiple-choice questions, however these students tended to respond against ineffective feedback, more than the inclusion of multiple-choice questions. This leads us into respondents’ requirement that instructors facilitate the learning environment, and provide ongoing and effective assessment. The need for these features could be related to respondents’ need to evaluate their learning progress, and to feel supported within a personalised learning environment. The qualitative feedback indicated that it was essential for courseware to foster a personal approach to learning, such as a welcoming and colloquial tone of language that is not too jargonistic, and by ensuring that learners’ are connected to their instructor and receive regular feedback. This may be because respondents require courseware where they feel supported within their learning environment. Extending upon the need for support however, whilst students require a more personal approach, through timely email responses from the instructor for example, academics require more support from the university in regards to the time and cost of providing effective responses to students. Some academics in particular point out that students can be demanding, and are concerned about the time effectiveness of online communication.

Respondents require courseware that effectively caters to speakers whose second language is English. This may be because many students within Australia’s Higher Education sector are students whose second language is English. For instance, learners whose second language is English had problems interpreting the use of slang within the courseware, and suggest that a link to an Australian-English speaking dictionary would be helpful. One participant whose second language was English pointed out that the inclusion of a range of multimedia options such as text, video and sound within the courseware, helped learners whose second language was English. This may be because some students are more familiar and prefer reading English, whereas others may prefer hearing and/or seeing their instructor. Finally, the open-ended questionnaire data indicated strong support of learning environments that foster real-world problem-solving, probably because students in particular perceive these

to be more meaningful and engaging to the intended profession they may be studying towards. Likewise, the courseware evaluation indicated strong support for the inclusion of constructivist learning environments (CLEs). This may be because the example CLE provided learners with a real-world case study that encouraged them to reflect, and involved an active approach to leaning, that was therefore more meaningful and engaging to respondents.

There was a divergence of opinions on the educational philosophy underpinning the design of courseware. This may be because respondents all had different belief-systems when it comes to how they learn. The feedback of some respondents indicated a preference for a behaviourist approach to learning. For instance, the researcher got the impression that some students preferred a teacher-centered approach to design, where they were strongly guided and directed by the instructor. This may be because these students are strategic learners, and prefer to regurgitate the instructor's beliefs in order to obtain high marks. It is worth pointing out however, that within the courseware participants who appeared to favour a teacher-centered approach to instruction – requesting stronger levels of guidance through the interface and navigation design for instance, also supported the inclusion of the CLE activity. This tends to support the researcher's perspective that a design based on both behaviourist and constructivist-oriented tenets may be supported within courseware. On the other hand, the feedback of some respondents appeared to indicate a preference for a constructivist approach to learning. For instance, one respondent requested a more 'open-ended, unstructured approach' to courseware design, with 'real-world activities' that were 'relevant' to their studies. Once more, it should be pointed out that within the courseware evaluation, some participants' whom appeared to support a constructivist approach to courseware design (such as the open-ended navigation, problem-based objectives, collaborative leaning environment, and the CLEs), also supported the inclusion of the games-based activities, which address lower order thinking skills such as classification and identification. Once more, this tends to support the researcher's perspective that a design based on both behaviourist and constructivist-oriented tenets may be supported within courseware.

This leads us into the issue regarding perspectives on the instructional guidance within courseware. There are a divergence of opinions on the level and type of instructional guidance within courseware. This may be because these research participants' subscribe to different educational philosophies. Many students give the impression that they are supportive of relatively high levels of instructional guidance within courseware, where they are provided with ongoing feedback and facilitation from the instructor. In practice however, students whom supported the learner-centered design features, also gave the impression that they needed stronger levels of guidance in regards to the interface and navigation

design, and feedback from the instructor. The overall impression by the researcher was that students tend to require higher levels of instructional guidance than academics are necessarily aware or prepared to provide. For instance, several academics pointed out that first year students in particular, are very demanding when it comes to receiving feedback, and somewhat reluctant to taking on full responsibility of their learning through an independent approach to studying. One academic pointed out that whilst independent learning was essential, it was very difficult to design and encourage learners' to become independent.

The qualitative analysis regarding the level of instructional guidance provided within the courseware shows that there are four areas of thought. The first area of though indicates satisfaction with the level of instructional guidance. This may be because these participants tended to prefer a learner-centered approach, where they could take control over how and what they learned. One respondent supports this belief in particular, as they liked the way in which the courseware layered the learning so that students' may take a surface or deeper approach. The second area of thought indicated a requirement for stronger levels of guidance, particularly amongst students. This may be because students require some level of instructional guidance, regardless of the philosophical approach to design in which they may have. For instance, several participants were keen to point out their pleasure with the high level of control they were given, regarding both the navigational fidelity and their learning. Whilst they believe that the flexibility of choice is good however, they also indicate a requirement for stronger levels of guidance. They point out that it may be possible for some students to 'get lost', particularly those whom require a stronger level of direction from teachers. Some participants believe this may be highlighted by the fact that the courseware is aimed at first year university students, whom are not used to a self-directed learning approach. Furthermore, whilst they believe the learning aids (such as the First Time Tutorial) and collaborative tools would help, they're not sure that they're entirely adequate. The third area of thought indicates a level of ambiguity and uncertainty. A few participants' comment on the need for courseware to provide an appropriate level of instructional guidance, nevertheless they avoid effectively answering whether the courseware achieves this. This may be because they believed that their feedback would imply a preference for a particular philosophy regarding educational design, which they were somewhat unwilling to make. The final area of thought comes from participants', particularly those from Education, whom imply that the level of instructional guidance may be somewhat inadequate. This may indicate that whilst some of these research participants' support constructivist-oriented principles in theory, in practice enabling learners may need stronger levels of guidance before they are able and/or willing to become more self-oriented in their learning.

There is a divergence of issues on the concept of deep learning. This may be because not all learners subscribe to a deep learning approach, whilst others may support the concept of deep learning but prefer a surface or strategic approach in a real-world situation. For instance, the qualitative data shows that that whilst participants' generally agree that deep learning is the ultimate form of learning, not all agree that learners' will necessary respond to a deep learning approach. For instance, within the courseware evaluation interviews, one respondent from Education points out that students are sometimes the learners they want to be, and although the courseware facilitates a deep learning approach some participants will prefer will prefer a deep or strategic approach to learning. The qualitative data shows that participants range from being not sure to strongly agreeing that the courseware facilitates a deep approach to learning. Those that were not sure point out that it is difficult to tell unless you have worked through the courseware as a learner. This perspective supports the need for ongoing and post-evaluation of the courseware from a learners' perspective, and the reality that the courseware evaluation is not a definitive evaluation of courseware design in general. That is, it provides a range of suggestions, ideas, and perspectives from a specific group of respondents, which should not be generalised across the population.

It is important to point out that no participant disagreed that the courseware can facilitate a deep learning approach, and respondents generally agree that the courseware provides the facilities for enabling deep learning to occur. One academic from Education points out that whilst it is difficult to tell whether deep learning will occur, because of the need to work through the courseware as a learner, the courseware facilitates the ability for higher order thinking more strongly than any other courseware he has approached before. This tends to indicate that the courseware design is perceived as somewhat innovative and creative by some of the participants. Another example of why the courseware may or may not be successful in promoting deep learning stems from the feedback of one participant from Education. He pointed out that whilst the courseware enabled a deep learning approach, the use of the collaborative tools, and in particular the facilitation of a student-instructor relationship was essential in order for students to reach their zone of proximal development and a deep approach to learning. He further points out that enabling peer-to-peer networking to develop a community of learners further enhance the ability for deep learning to occur. Whilst he points out that the courseware provides for this, it would need to be used within a real-world situation to assess its effectiveness. Nevertheless, he believes that it goes a long way towards providing the opportunity for deep learning to occur through the design of the collaborative and social learning environment.

Participants' whom believe the courseware encourages a deep learning approach, point to four enabling features: the design of the objectives; the assignment-based approach; the constructivist learning environment; and the collaborative design. When it came to the design

of the objectives, there was general agreement that the option for learners' to negotiate the way they achieve the objectives (co-construction) would encourage them to develop a more meaningful relationship with the learning material. Nevertheless, some students appeared slightly uncomfortable with the open-ended nature of the objectives. This may be because many students generally prefer a moderate to high level of guidance when it comes to their learning. There was resounding agreement that the problem-based approach to the assignments encourages learners to become more independent, and would help engage them with the material. Several pointed out that the problem-based approach was motivating, because they had a choice in regards to 'what' and 'how' to learn. The constructivist learning environment (CLE) case study was particularly important in enabling higher order thinking to occur. One participant from Education however, points out that one of the activities associated with the case study could be altered to better engage learners and encourage deep learning. This again emphasises the importance of evaluation in developing a successful learning environment.

There is a divergence of opinions on collaborative learning online. There is general agreement that collaboration is important to learning, but a difference of opinion in regards to how this occurs. In general, participants' believe a face-to-face element to teaching and learning should be maintained, so that collaboration can occur on a face-to-face basis. This may be because they perceive courseware to be somewhat impersonal, or it may be that they tend to be inexperienced with using synchronous collaborative tools that may or may not enable a more personal approach to collaboration. One student was adamant that she could only collaborate on a face-to-face basis, and that the social nature of 'meeting and greeting' and 'talking to' students face-to-face was essential in order to maintain her learner motivation. Likewise, respondents responded very favourably to the possibility of 'meeting' and 'sharing information' with other students, in regards to the optional face-to-face meetings suggested in the courseware. Furthermore, one participant pointed out that these meetings would be 'essential' in enabling a community of learners to develop. This tends to suggest that these participants believe collaborative learning cannot take place effectively, unless a face-to-face component is maintained as part of teaching and learning online. There was general agreement that courseware should enable a teacher-student relationship to develop, and as discussed above one respondent from Education pointed out that learners could not reach their zone of proximal development online, without courseware facilitating this collaborative relationship. Whilst students tend to be very supportive of developing a student-instructor relationship, not all academics are wholly positive. They tend to perceive courseware as being somewhat ineffective in regards to the time it takes to facilitate learning. This may partly be because they have not effectively designed an effective model for communicating with learners. For instance, several interview participants pointed out that a

preconceived time/date should be listed for synchronous and asynchronous communication, in order to ensure time and pedagogical effectiveness.

Some participants were somewhat against collaborative learning. This may be because discussion boards and chat rooms may not be facilitated by lecturers, or used actively by other students. For example, some participants complain about a lack of active participation in discussion boards by academics, whilst others complain that when they used the collaborative tools there was a lack of participation by other learners, which decreased their motivation in using the tools. For instance, one student pointed out that every time she logged in to a courseware and went to a chat room, she was the only person there, which negatively affected her opinion of online collaboration. Thus, the perceived ineffectiveness of contemporary courseware's use of the collaborative tools, may contribute to these research participants' belief that courseware is pedagogically ineffective, impersonal, and somewhat unreliable. Finally, when it comes to collaboration there are differing opinions on peer-peer communication. Some respondents strongly support peer-collaboration, and this could be because they subscribe to a social constructivist philosophy. Other respondents tend to dislike peer-collaboration, and prefer to develop a relationship solely with the instructor as opposed to their peers. This may be because their learning style preferences a more personal learning approach, to a social learning approach. For instance, one of the interview participants pointed out that he dislikes being forced to collaborate with peers, and that this was one reason why he had disliked using courseware as a student.

Finally, there is a divergence of opinions on the concept of independent learning. The qualitative data shows that academics in particular, believe that independent learning is essential when it comes to Higher Education. This may be because they believe students should be more self-oriented, or it may be because they associate higher order thinking (which Higher Education encourages) with independent learning. Nevertheless, academics also believe that achieving getting learners to become independent learners is difficult as it dependents on their self-motivation. There was a belief amongst some academics that whether independent learning actually occurred was 'out of their hands'. Whilst many students support the value of independent learning, they also focus on the importance of academics in facilitating their learning. The feedback of some students in particular, gave the researcher the impression that they'd prefer a teacher-centered approach, where they were somewhat over-reliant upon the academic for guidance. For instance, one student pointed out that she wasn't a good independent learner, and required the attention of the instructor and her peers to maintain her motivation. Nearly all participants agreed that the courseware enables the opportunity for independent learning to occur, particularly through the constructivistic approach it takes. For instance, they points to the assignments-based approach, the constructivist learning environment (CLE), the abundance of links where

learners' may access further information, and the feeling that they are in a supportive environment with access to a range of help and collaborative resources. The concern for some participants however, is that they are not sure whether independent learning will take place, because they have not worked through the courseware in a real-world situation as learners. This points once more, to the need for ongoing and post-evaluation of courseware, and the reality that this research can only provide a somewhat limited perspective regarding courseware evaluation when it comes to its actual use in a real-world situation.

6.4.2.2 General Comments: Prototype Courseware Evaluation

The general attitude from respondents was that the learner-friendly design of the courseware was its strength, and that it was both innovative and creative. Interview participants were much keener on the learner-friendly design to the web-based participants, and this may be because they had a better understanding of the rationale behind the design. For instance, although the courseware was geared towards a constructivist-oriented methodology, it purposely included games-based activities aimed at both lower and higher order thinking, in order to see whether students' respondent positively to these. The feedback from one of the web-based participants whom was an instructional designer pointed out that the inclusion of activities directed at 'recall and memorisation' was 'suspect', and that the researcher should consider more meaningful activities. Contrary to this, participants from the face-to-face interviews understood that the activities were purposely directed at both lower and higher order thinking. Students in particular, were supportive of both these activities, and as previously discussed, made a link between the inclusion of these activities and their engagement online.

Participants generally believed that the courseware could address deep-learning and they point to the constructivistic features in enabling this to occur, particularly the problem-based approach, the enabling of collaborative learning, the inclusion of multiple resources such as databases and rss tools, and the inclusion of the constructivist learning environment (CLE). Nevertheless, there was a belief by some participants that not all participants may want to become deep learners, and that a post-evaluation of the courseware from a learners' perspective was required in order to fully assess whether deep learning occurs. Interestingly, most participants' specifically liked that the courseware designer provided for optional face-to-face meetings, perhaps because these participants strongly support a face-to-face element to courseware in being maintained. One of the most important sub-themes to emerge from the qualitative data however, which did not directly relate to the objectives of this research, was the need to consider the time and cost associated with developing the learning design. This may be because academics' tend to perceive themselves as somewhat unsupported by the university when it comes to developing and maintaining courseware. For instance, during the run-through of the courseware, the researcher was interrupted by one

academic, whom pointed to the time-consuming nature of developing the features within the courseware. He pointed out that academics are generally responsible for the design and development of courseware, and that whilst innovation is important, he wanted to see 'hard data' on the effectiveness of specific features of courseware design in order to decide whether he would implement them in a real-world situation. For instance, he wanted a 'guarantee' that he would get more students, if he implemented the games-based activities. This introduces a problematic concept, that is, if innovation is dependent upon academics already pushed time constraints, then the researcher suggests that it cannot occur without further support from institutions.

The theory on constructivist learning environments translated effectively intro practice, as participants responded favourably to the inclusion of the CLE case study, and several pointed out that the strength of the courseware was its ability to engage them through the CLE case study. The theory necessitating the need to address different learning styles also translated effectively into practice, as participants responded favourably to the inclusion of the multi-media box, and several participants pointed out that one of the strengths of the courseware was its ability to engage them through the inclusion of a range of mixed-media modes. It is difficult to assess whether the researcher's interpretation of the theory on deep and independent learning was effective. Whilst participants' generally agreed that the courseware provides the tools for enabling learners to become deep and self-oriented in their approach, they point out that it is difficult to tell whether this would occur because they have not actually worked through the courseware in a real-world situation as a learner. Furthermore, some respondents point out that not all learners want to be deep or independent learners, and may prefer a surface or strategic approach to learning with stronger levels of guidance by the instructor.

The overly-flexible nature of the courseware was problematic for some students, particularly when it came to the level of instructional guidance. Some felt overwhelmed by the level of learner-control, whilst others liked the flexibility and control they had over their own learning. This suggests that a balance between instructional guidance and learner-control needs to be maintained, for the courseware to be effective for all learners. The appropriation of the theory and practice on collaborative learning translated with mixed reviews. Whilst many respondents supported the potential for collaborative learning to occur, they also pointed out that not all learners wanted to collaborate with other learners, and that the use of the collaborative tools depends strongly upon the group using the courseware at the time. Finally, it was very interesting to the learner that there appears to be an ongoing role for teacher-centered guidance, and that the role of learner-centered guidance may need to be reviewed in order for learning to occur successfully. For example, many students within the courseware evaluation requested stronger levels of teacher-guidance, through a more

structured approach to the courseware's navigation, high levels of feedback and facilitation of the courseware by the instructor, and the inclusion of rote-based activities that enables them to self-test their understanding of the content they've covered.

6.5 Conclusion

This chapter has provided an analysis of the qualitative component of this research. This involved analysing both the open-ended questionnaire data, and the courseware evaluation. Data stemming from the courseware evaluation came from face-to-face interviews, and emails from web-based participants. A brief discussion of the findings was briefly presented, in relation to the relevant objectives listed in this study. The qualitative analysis focuses on the themes of teaching and learning online, user-friendly design, and learner-friendly design. A special focus was paid to constructivistic-design tenets. The data in this chapter helped provide new insights to existing sub-themes. For instance, the quantitative component of this research indicated that participants' supported self-tests. This qualitative component of this research indicated that the research participants considered self-tests an important element in monitoring learners' progress, however they also specified a need for quick, relevant, and in-depth feedback in order for them to learn effectively. This chapter also detailed some new sub-themes, such as the time and cost issues associated with developing courseware. Finally, it discussed how effectively the researcher's appropriation of the theory and practice on courseware design was, by detailing respondents' perception to the user-friendly and learner-friendly design of the prototype courseware. The next chapter provide the Conclusion of this research. It will revisit the aims and objectives of this research, look at how the courseware has addressed the associated research questions, and address some of the limitations and new themes emerging from this research.

Chapter Seven: Conclusion

7.1 Overview

Quynh Le (1999) points out that conducting research is like conducting an excursion, where at the end participants start to understand the whole picture, and what has been planned at the beginning of the chapter can be different when the excursion ends. Since this is the final chapter in this thesis, the metaphorical research journey ends here. Hopefully, this chapter will show that generally, what was planned at the beginning of the research journey was fulfilled, although many interesting and unexpected findings also emerged. So far, this thesis has covered six chapters. This chapter presents a discussion of the research journey at its conclusion, it looks at what has been achieved, what has not been achieved, and what new concepts have emerged. Some of the limitations of the research are provided, and an overall discussion of the findings are presented, according to the four themes of teaching and learning online, user-friendly design, learner-friendly design, and behaviourist and constructivist-oriented design. Both the quantitative and qualitative findings are presented, each providing a different insight into an aspect of courseware design. In particular, the qualitative findings help provide a rationale to some aspects of the numerical questionnaire data, as well as producing some emerging insights the numerical questionnaire data cannot provide on its own. The discussion seeks to answer directly to the original objectives. For instance, the discussion of teaching and learning online is divided into four sub-sections, each addressing one of the research questions relating to the objective on teaching and learning online. The courseware evaluation is also presented, according to participants' attitudes to the user-friendly courseware design, and participants' attitudes to the learner-friendly courseware design. We also look specifically at whether the theory and practice on courseware design translates effective into practice. This part of the chapter seeks to

address the fifth objective, on the construction and evaluation of a fully-online prototype courseware designed specifically for this research. The chapter then looks at the future of this research, assessing in particular what aspects of the research could be looked at in further detail. Finally, we conclude the chapter with an overall assessment of the research journey at its very final conclusion.

7.2 Research Journey at its Conclusion

The researcher mentioned in the Introduction chapter, that the research journey really began ten years ago, after the researcher has designed her first courseware as part of a Computer Aided Learning course. This course sparked an interest in the design of educational software, and it triggered into the research the importance of incorporating user-friendly and learner-friendly design. One of the main interests emanating from the researcher's foray into educational software however, was the apparent lack of conversation between usability designers (including screen design, navigation and usability), and educational designers (including the pedagogical design). Since the researcher's first foray into the design of educational software, the same themes continue to spark her interest, and remain important issues. The original intention behind this research was to investigate whether a participants' background, such as their occupation, influence their perspective behind the user-friendly design and learner-friendly design of courseware. For instance, do students have significantly different opinions on the importance of screen design, compared to academics and experts? Another aim of this research was to look at how contemporary participants of teaching and learning online within Higher Education perceive the strengths and weaknesses of courseware, in their own words. For instance, do they perceive the strengths of contemporary courseware to be the user-friendly design? A further intention behind this research was to look at how a fully-online prototype courseware could be designed and developed based on user-friendly constructivist-oriented principles, and to see how a focus group of students, academics, and experts perceive this courseware. Particular interest lied in their perceptions of the learner-centered constructivist-oriented features, in order to help assess the viability of constructivism according to a real-world situation. All in all, the researcher achieved her aims. Significant differences of opinion were found according to age, occupation, gender, institution, familiarity with teaching and learning online, and computer literacy, according to questions on teaching and learning online, user-friendly design, learner-friendly design, and its subset behaviourist and constructivist-oriented design.

Statistically significant differences of opinion were found according to occupation, when it comes to whether an open-ended environment should be present in courseware. Where academics from Education strongly agree open-ended environment should be present, students, academics from Other Disciplines and web developers agree, and instructional

designers are not sure. The researcher also found that participants' perceive a myriad of strengths and weaknesses on courseware design. Nevertheless, the open-endedness of the questionnaires qualitative component meant that the feedback was often too general, and participants' tended to provide their argument in dot points without an in-depth description behind them. For instance participants would point out that they were concerned about 'navigation and poor screen design', without necessarily stating how these aspects of design are worrying to them. On reflection, it would have been better to word the open-ended component of the questionnaire to ask participants' to state their perceived strengths and weaknesses of courseware, and to justify their opinion with an example. It would also have been better to ask participants specifically about their opinions on either the user-friendly or learner-friendly design, because most of the feedback surrounded the user-friendly design of courseware, and it would have been better to have had more feedback on the learner-friendly design of courseware. Since the feedback on the open-ended questionnaire was quite general, it was very important that the research obtained participants' perspectives of an example courseware prototype.

This enabled the researcher to obtain some contemporary opinions on specific aspects of the user-friendly and learner-friendly courseware design. The courseware design and evaluation was successful in terms of the researcher obtaining a better understanding of how the contemporary theory on learner-centered design can be applied to practice, and assessing how this courseware is perceived using real-world examples. Nevertheless, it was clear to the researcher that some participants were concerned that the user-friendly design could have been improved, and this presented some new insights to the researcher on the overwhelming task involved in designing and developing courseware. In short, good courseware is a team-effort, and takes time and money. One of the emerging insights from this research was the time and cost on the design of courseware. Interestingly, academics and designers were concerned about the time and cost involved in developing courseware, and some academics pointed out the need for design-elements to be justified quantitatively before they are implemented. In contrast to this, students were very demanding in terms of their design-requirements, preferring high-quality media and a strong teacher presence.

It was clear upon concluding the analysis of this research, that producing good courseware requires institutional support, a team-effort, and post-evaluation in order to assess the success of the courseware more objectively. Although the researcher achieved her aim in designing, developing and evaluating a prototype courseware, it was clear towards the end of the research that the feedback on the success of the courseware was formative and of a predictive nature. For instance, participants' frequently pointed out that it was difficult to evaluate the courseware without using it as a student, and that their opinions were only of how they thought they'd perceive the courseware as they'd use it in the real world. It is clear

that there is much scope for research on courseware evaluation, from both a summative and formative perspective. Nevertheless, many interesting insights were received by the researcher on the design of the courseware, which indicates that there is still value in formative evaluation. For example, several students pointed out how the design could be altered to enhance deeper learning, by enabling learners' to share resources through a collaborative tool. Suggestions such as these help the researcher in designing effective engaging courseware, and are essential in considering the design of a learner-centered courseware. In short, one of the enduring themes emanating from this research, was the knowledge that courseware cannot be learner-centered unless it is assessed by the learners' themselves.

7.3 Limitations

The majority of participants from Higher Education came from the University of Tasmania, mainly because of the ease of access the researcher had to these participants. It would have been better however, to have participants from a much broader range of Australian universities. The majority of participants from the professional realm came from registered training providers in Melbourne, again because of the ease of access the researcher had to these participants. It would have been better however, to have participants from a much broader professional base outside of Melbourne. The number of professionals participating in the study is small, particularly web developers, and it is worth emphasising that the findings should not be generalised across the population. The open-ended component of the questionnaire data asked participants what their perceived strengths and weaknesses of courseware are. Upon reflection, the design of the questionnaire's open-ended component probably should have been more specific, by asking participants' to state their perceived strengths or weaknesses as well as their underlying rationale behind their answers. Unfortunately, most of the open-ended questionnaire feedback contained dot-points, and in many cases it is unclear why participants' listed their perceived strength or weakness. For example, some participants that they'd like to see better navigation in courseware, however they do not provide information in regards to why they perceive navigation to be a problem. This may have been prevented through the questionnaire design. The open-ended component of the questionnaire should also have asked participants to list their perceived strengths and weaknesses of courseware, according to user-friendly design, and learner-friendly design. The majority of feedback on the perceived strengths and weaknesses of courseware surrounded the user-friendly design. Although this might highlight the importance of user-friendly design to courseware, it would have been better for the research to have more feedback on the learner-friendly design. When it comes to the development of the courseware, it would have been better for the researcher to have a professional web developer develop the course. The courseware evaluation showed that although the researcher assumed the courseware was generally user-friendly, it still had a long way to go

before it was highly usable. For instance, several participants complained about the use of clip-art, and would have preferred high-end graphics in its place. A web developer would have been able to design a more professional aesthetic in terms of the graphics. Finally, the formative evaluation of the prototype courseware showed that it was only possible for the researcher to obtain a limited understanding of how effective the design of the courseware is in practice. It was clear that in order to fully assess the courseware's effectiveness, a formative evaluation of the courseware is required, from the perspective of a learner who had used the course. Nevertheless, the evaluation in this study still provides some important insights into the design and perceptions of a courseware based on the contemporary literature.

7.4 Overall Discussion of Findings

7.4.1 Teaching and Learning Online

Overall the research participants appeared to support the use of courseware within teaching and learning online. There were few overtly negative comments on the use of courseware, and the quantitative results showed that participants generally weren't sure whether online participation increased their motivation more than face-to-face participation. The researcher interpreted this result to mean than using courseware did not necessarily motivate participants less. On the other hand, it also means that using courseware doesn't necessarily motivate participants more either. There was however, a strong preference for courseware to be used in addition to face-to-face interaction, particularly by academics from Education and students from all disciplines within both the quantitative and qualitative components. This finding is supported by the research of Felix (2001), who found that most students in the study preferred to use web based materials as an addition to face-to-face teaching used in the classroom. The qualitative component showed that participants' believed maintaining a level of face-to-face teaching was essential in order to maintain their learner motivation, as courseware was perceived as somewhat impersonal, unreliable, and sometimes pedagogically ineffective. This finding is supported by the research of Le and Le (2001) whose research participants viewed the negative aspects of the web as impersonal, unreliable, and imposing.

Ten students, academics, and experts were asked to define courseware within the courseware evaluation interviews. Interestingly, not all participants were familiar with courseware, and were somewhat unsure of how to define courseware. This supports Bell et al. (2002) finding that courseware is still relatively new to teaching and learning online within Higher Education. All participants agreed that courseware should be focused on learning and be pre-designed in some way. Not all participants agreed however on the way in which courseware should be designed. Some thought that providing supplementary material was

enough, whereas others believed that courseware should have more depth and be both interactive and web dependent. Whilst not all participants agree that courseware should necessarily include collaboration, nearly all respondents agree that it would be better for courseware to include at least contact with the lecturer. Some respondents went further and suggested learning would not be possible without developing a strong teacher-student relationship via the courseware. Students from Felix's (2001) study also suggest that their least favourite mode of study would be as a distance learner without access to an online tutor, so the findings from this study appear to support those of Felix's.

Participants in this study view the strengths of courseware as a learning aid. This supports Le and Le's findings (2001, 2007a) that computers are effective learning tools. Participants in this study would like to see courseware that is more interactive, however they have varying opinions in regards to how they define interactivity. Some defined interactivity as navigational flexibility (hyperlinking between documents), whereas others saw interactivity as including multimedia elements (sound, voice, video, graphics), and other saw interactivity as comprising contact with their peers or online tutor. The quantitative results showed that students supported online chat as an effective alternative to face-to- face learning, whereas academics and experts weren't sure. The qualitative data also shows a strong preference for synchronous chat modes to be available to students. This contrasts to the research of Warrick, Connors, and Norton (2004) whom found that students preferred email and asynchronous discussion groups to the use of synchronous chat. Nevertheless, they believed that this finding could have occurred because of the difficulty of students organising a suitable time to chat. The qualitative findings in this study show that organising a suitable time for all students and the online tutor to be available to chat online is an important issue. Further research into the use of online chat would be helpful. The qualitative findings also show that participants believe courseware should be well-designed. Zaharias highlighted the importance of good design and Poulymenakou (2003) whom point out that poor design is a basic reason for the dropout from e-learning courses.

The quantitative component of this study showed that instructional designers had a much higher Mean score compared to other groups when it came to whether online participation increases their motivation more than face-to-face participation. This may be because they are somewhat frustrated with the limitations they have as instructional designers in a commercial training environment, and they believe the design suffers as a result of their limitations. Further research is required in order to find out whether this finding occurs within other studies, and why this may be the case. The qualitative component of the study showed that participants were concerned that courseware is used as a substitute for face-to-face training, and they strongly recommended the use of face-to-face training in addition to courseware. Again, this could be because they view courseware as somewhat unreliable and

impersonal. Le and Le (2001) found that their research participants viewed computer bugs and technical problems associated with using computers as causing significant distress upon learners. They also viewed the web as 'not really being interaction', as it would be in face-to-face settings. These findings are further supported in the qualitative findings in this research, which found that participants were worried that courseware is unreliable and difficult to use, particularly because of problems associated with using the software and hardware. To some extent, this highlights the need for effective evaluation of the courseware, as suggested by Zaharias (2006a) and Zaharias and Poulymenakou (2006b). Participants in this study, particularly those from older generations, were also concerned about the ergonomics of sitting in front of a computer for long periods of time. Fisher et al. (2006) found that the classroom environment significantly affects students. It could be that the online environment has a similar affect upon students. More research is required into how this may occur.

An unexpected finding and motif running throughout this study is that the qualitative results show that academics are significantly concerned by the time consuming nature involved in designing, development, and delivering courseware. One academic pointed out that courseware takes significant amounts of time away from her personal research time, and that she felt somewhat unsupported by the university in terms of her initiative in delivering courseware for students. Several academics pointed out the time consuming nature of answering students' emails, and the demanding nature of students in terms of receiving timely replies. Within the courseware evaluation, one academic referred specifically to the time and cost involved in designing courseware, and wanted the design of courseware to be justified in terms of quantitative numbers. In contrast to this, students appeared very supportive of features, which take time and cost to develop, such as the development of a range of multimedia to meet different learning styles. Although it was not the intention of this research to focus of on participants' perspectives on the demands of delivering courseware and the teaching and learning requirements, one of the recurring motifs running through this study are the time and cost issues versus the design requirements of courseware. Further research is needed in this area, particularly to see whether the quality of courseware is being eroded by the potentially unrealistic demands academics have in its delivery. Finally, there was a statistically significant difference opinion according to age for whether online participation increases respondents' motivation more than face-to-face participation. Participants from the youngest age group 18-29 were statistically more supportive of online participation, compared to those from the 40-49 years old. This may be because younger students tend to be more technologically literature. Nevertheless, it is unclear why statistical significant occurred for participants aged 40-49, and not other age groups. Further research is required to see whether this finding occurs in other studies.

7.4.2 User-Friendly Courseware Design

This research found that effective user-friendly design is essential for (1) enabling teaching and learning online (2) engaging learners online (3) preventing learners from becoming distracted and (4) enabling the effective flow of learning to occur. The majority of feedback on the open-ended questionnaire data centered on the user-friendly design, and when asked to provided their own perspective on the design of the prototype courseware designed for this study, most participants referred to aspects of the user-friendly design. Whilst the researcher anticipated that the user-friendly design would be important to participants, she did not anticipate just how important. Most participants were more concerned with aspects relating to the user-friendly design, and it was clear that usability issues needed to be addressed more within the practice of courseware delivery. The need for courseware to be usable is supported in the literature. Zaharias (2004) found that usability is a basic element for online learning, and that it means putting the users and their needs at the centre of design. Likewise, Zaharias and Poulymenakou (2006b) point out the need for "usable and effective e-learning design" (p.88). There appeared to be a strong relationship between the visual design and the learning design of courseware. For example, behaviourist instruction tends to be associated with direct navigational routes (linear learning structures), whereas constructivist learning tends to be associated with open-ended navigational routes. The quantitative feedback however showed that learners' wanted both direction and open-endedness. Likewise, the qualitative feedback showed that whilst some participants wanted linear structures, others preferred open-ended navigation. It is clear that an instructional environment needs to cater to both direction and flexibility, and that there is a strong relationship between the navigational design and the learning design. In other words, the researcher tends to suggest that courseware should appropriate elements of both behaviourism (direction) and constructivism (flexibility) within courseware, and that the two concepts could perhaps be complementary toolkits. This is supported in the literature by Cronje (2000) whom points out that objectivism (behaviourism) and constructivism are not opposing paradigms but complementary approaches.

The quantitative data showed that the research participants strongly agree courseware should utilise effective usability, such as good screen design, clear navigation, and a help menu. Participants strongly agree that screen design and layout affected their ability to use the courseware, and they agree that attractive screen design enhances their motivation to learn. The importance of screen design is reflected in the literature. Kanuka and Szabo (1999) found that subjects which use good screen design principles require less study time and have a higher completion rate. They believe that good screen design plays a paramount role in maintaining learners' interest. The qualitative data showed that screen design and layout played an essential part in maintaining participants' interest. In particular, there was a

strong response for courseware to be visually pleasing. Kanuka and Szabo (1999) point out that we are good visual learners, and that good visual design is essential to the learning design. Interestingly however, respondents (particularly students) pointed out that courseware with 'bland' colours such as black and white combinations does not engage them, and emphasise the importance of bright colour combinations in order to engage learners. The courseware evaluation showed that participants' positively responded to the unusual colour combination, which was bright, and did not fall into the traditional educational mode of using muted hues. The researcher believes that attractive colours play a significant role in motivating learners online, although it can also affect their ability to focus if it impacts upon usability. There is a gap in the literature on the relevance of attractive aesthetics to learning. Kanuka and Szabo (1999) point out that there is a gap in the literature that addresses the relevance of screen design to instructional design. This may be because the concepts of user-friendly design and learner-friendly design tend to be considered as opposing, in contrast to complementary factors in courseware design. As Squires (1999) points out, workers in human-computer interface design (user-friendly design), rarely speak to those involved in educational computer (learner-friendly design). Faiola and DeBloois (1988) found that good screen design is an important interface factor, and can result in improved performance through engaging the learner and reducing usability problems. Reiber and Kini (1991) found that well-designed computer graphics may enhance learning.

The qualitative components of the literature show that there is strong support for effective screen design and layout, information organisation, aesthetically pleasing interfaces, flexible navigation, graphics and multimedia objects, enhanced usability, and ICT Support. When it came to the navigation, participants expressed a strong dislike against courseware that forces a specific path, and wanted a high degree of learner-control. There is much support in the literature for learner control of the pacing of courseware (Laurillard, 2002; Janicki and Liegle, 2001). Participants also disliked excessive clicking for getting to a destination, and wanted to get to the end-point using a limited number of clicks. McCracken and Wolfe (2004) support the importance of limiting the number of clicks between destinations in the research. The strong requirement for graphics emphasises that participants' tend to be visual learners. Nevertheless, the qualitative data also shows a strong relationship between the visual design and learning, in terms of participants' requesting that graphics be relevant to the learning. There appears to be strong dislike against meaningless 'graphics for graphics sake', and the use of poorly designed graphics such as clip art. This is supported in the literature, as Kanuka and Szabo (1999) point out that the mere presence of visuals is not enough, if they are not relevant and meaningful to the learning.

The qualitative component of the literature also shows that participants are concerned about poor screen design and layout, aesthetically steroid interfaces (black and white interfaces as

opposed to colourful interfaces), poor navigation, a lack of learner-control, being inconvenienced, accessibility problems, and learning management system problems. The importance of clear and consistent navigation is strongly supported in the literature (Kristof and Sartran, 1995). Nevertheless, implementing effective navigation is much more difficult in practice. For instance, the researcher utilised the web-based heuristics on navigational design of consistency, and ensuring users/learners knew where they were, where they could go, and how they could get back. Nevertheless, interview participants still had problems navigating the courseware. This emphasises the importance of educational evaluation. Within this research the problem of being inconvenienced is a major issue on the usability of courseware, nevertheless there is a significant gap in the literature on the impact poor usability has upon learning. There is also a gap in the literature on the importance of accessibility to learning. This research indicates that catering for accessibility is an important element to ensuring online learning is successful, particularly for elderly, it also suggests that it may address different learning styles. For example, questionnaire data indicated that participants would like to see a greater use of multimedia within courseware. The courseware designed for this research included a range of accessibility options that enabled learners' to download a range of media, within text, video, or voice options. Research participants suggested that this provision not only enhances the courseware's accessibility, but it also addressed different learner styles. The importance of addressing different learning styles is supported within the literature of online learning (Meacham, 2003). When it comes to the problems participants had in regards to the learning management system, it was difficult for the researcher to assess whether the problem was related to the design of the courseware by the instructional designer/web designer, or to problems with the technology itself. For instance, some respondents listed that there were problems with navigating the WebCT Vista interface, however it was difficult to tell whether the problem existed with the Vista interface, or with how the designer has used Vista to develop courseware. Further research is required in order to assess the impact of learning management systems upon participants' usability, in particular looking at how in-built functionality of learning management systems may impact upon the usability design of courseware.

Finally, there were statistically significant differences of opinion in regards to age, when it comes to whether learners' should be given clear and direct navigational guidance. Participants from the youngest age group 18-29 needed navigational guidance much less than those from the next age group 20-39. The researcher is unsure why this may be the case, and suggests further research may shed light on this issue. When it comes to whether courseware should utilise effective usability, younger participants were less keen than those aged 30-39 and 50-59. This may be because they are more technologically literature, and require less help. Felix (2001) found that younger students tended to be more comfortable with using technology. Participants from professional training providers considered usability

much more important than those from the University of Tasmania, perhaps because they have more experience with the delivery of courseware. Those with the most familiarity with teaching and learning, and highest level of computer literacy also viewed usability to be significantly more important than other groups. This may be because they have more experience with using courseware, and are more aware of the pitfalls of poor design. More research is required in order to test this theory however. Finally, those with the highest levels of computer literacy viewed attractive screen design to be significantly more important to their learning, than those with average levels of computer literacy. Again, this may be because they are more familiar with software design, d and have found attractive aesthetics to be important to their motivation. More research is required into the impact of aesthetics on learning, and in particular how participants' levels of computer literacy may or may not impact upon the aesthetic aspect of screen design.

7.4.3 Learner-Friendly Courseware Design

Myhill, Le and Le (1999) and Le (1999) point out courseware should be designed based on both user-friendly principles (considering usability and technology) and learner-friendly principles (considering educational component of design). Learner-friendly courseware design means brining in an educational context to the design of courseware, looking specifically at the pedagogical principles and heuristics that contribute to effective learning. This involves looking specifically at those features that engage and motivate learners. Although researcher's take it for granted that students, academics and experts all agree courseware should be based on educational philosophies, there is very little literature that looks at whether this is true in a real-world setting. This study affirmed that courseware should be based on educational principles and philosophies, according to a group of contemporary students, academics, and instructional designers. Not surprisingly, instructional designers strongly agree that courseware should be based on educational principles and philosophies. The literature also takes for granted that courseware should accommodate different learning styles, although few studies look at how those involved in the design and use of courseware feel. Brualdi (1996) recognises that Gardner's Theory of Multiple Intelligences means that educators should recognise and teach to a broader range of talents, including logical/mathematical, linguistic/verbal, visual/spatial, musical/rhythmic, bodily/kinaesthetic and personal/intrapersonal intelligences. Meacham (2003) strongly supports designers in engaging as many different intelligences as possible, in order to enhance student learning online. This research supports Meacham's opinion, as the quantitative findings of the study found that students, academics and experts strongly agree courseware should accommodate different learning styles, and utilise a range of mixed modes such as text, graphics, video and sound. Interestingly, the qualitative findings provide further information on the use of mixed media, indicating that students want media that is relevant to the context of learning, and helps them understand the content they're covering.

In other words, they do not want ‘bells and whistles’, but the use of media that is educationally relevant.

When it comes to the requirements for learner-friendly design, the quantitative results suggest that learners’ want to be consulted in the design of courseware, and that courseware should support flexible learning, and contain a range of resources. The support for learners’ consultation in the construction of courseware reaffirms the tenet of learner-centered courseware, that learners play an active role in the development of their learning (Nunan, 1998; Neo and Neo, 2002). The requirement for courseware to be flexible – allowing learning ‘anytime and anywhere’ and providing a high level of navigational flexibility is supported both within the qualitative results of the questionnaire data, as well as the literature (Swan, 2003). The qualitative results of the questionnaire data indicated that participants’ viewed the computer as an important resources for accessing relevant information ‘just in time’, and were frustrated when they were unable to access resources because of a lack of provision by the university (such as databases). This highlights Le and Le (2007a) and Jonassen et al’s (2003) belief that computers are important tools for learning. The open-ended questionnaire data indicated that there were multiple perspectives of interactivity. Some participants’ specified generic requirements for ‘interactivity’, whilst others indicated interactivity to contain hyperlinking between documents, activities such as multiple-choice, or communication with their peers or lecturer. Le (1999) also found that whilst participants required interactive courseware, there were differing perspectives on what this entailed.

Within the literature Zaharias and Poulymenakou (2006c) define interactivity to include content related interactions and the support of meaningful learning. Further research into this issue could help define learners’ definition of interactivity, compared to academics and experts. There is little literature in the educational-related research on personalisation, however the literature does indicate that courseware may help provide more individualistic learning experiences (Reigeluth, 1999b). The qualitative component of the research also indicated that there is a strong requirement for courseware to include high levels of facilitation by the lecturer. Participants wanted to feel they were supported within the learning environment, and the presence of a lecturer online appeared to be an enabling factor here. This supports the research of Felix (2001) whom found that the presence of an online teacher was an important factor in maintaining learner motivation. The final requirement relating to the learner-friendly design of this research was for lecturers to provide prompt and meaningful feedback. Some participants’ indicated frustration with the asynchronous mode of communicating online, indicating that the delay in accessing teacher’s help online impacted upon their learning experience. Participants’ also indicated frustration with feedback that provided a simple ‘yes or no’ answer, and preferred more meaningful and constructive feedback. The requirement for prompt feedback is supported in the literature by Chickering

and Gamson (1996), whereas Keeton, Schekley and Griggs (2002) and Zaharias and Poulymenakou (2006c) emphasise the importance of providing learners with constructive and meaningful feedback. This research provides further insight into the issue of feedback by showing that academics were worried about the time it takes to provide feedback online. Further research could help assess the impact time constraints have upon the quality of academics' replies, and whether synchronous modes of communication could be more effective than asynchronous modes of communication in terms of providing more timely and effective feedback.

The research indicated that participants had mixed opinions on independent learning and self-tests. The theory on learner-centered design supports students move from dependent to independent learners (Williams and Bialac, 2006; Hsi and Gayle, 2003). Most academics agree that students should be independent learners, and that their teaching strategy should scaffold learners towards being independent learners. Nevertheless, they also recognise the difficulty in getting students to become more self-directed in their learning. For example, the research of Diaz and Bontenbal (2001) points out that whilst some online learners are independent learners, other learners' personal learning style may be avoidant, collaborative, dependent, competitive, or participatory. The quantitative results of this study show that participants agree that courseware should encourage independent learning, however the qualitative results show a mixture of opinions. Some students wanted a higher level of teacher guidance others supported a high level of self-direction, whereas a third group supported a mixture of teacher guidance and learner independence. In opposition to the research on independent learning, one academic emphasised the importance of teacher-control, and pointed out that she did not want students to have access to all the course content, but move from week to week at the pace that she sets.

When it came to self-tests the quantitative data and qualitative data both supported the use of self-tests, however there was a mixture of opinions on the design of self-tests when it came to the use of multiple-choice questions. In particular, learners' were divided about the use of self test for lower order thinking (recall and memorisation), some appeared keen, others weren't sure, whereas a final group were strongly against self-tests promoting to promote lower order thinking. The literature indicates that the use of multiple-choice questions for self-testing is a controversial issue. Some researchers strongly disagree with the use of multiple-choice testing, believing that they encourage students to 'guess' answers (Bork, 2003; Wilmsore, 2003). Bork (2003) points out "Multiple-choice is a terrible technique for any to use … Students call it multiple guess" (www, para 1). Others point out that multiple-choice testing may be constructed in a way that encourages higher order thinking (construction and reflection), but that they are an ineffective measure of student performance (Waters, 2003). Finally, other researchers (Mulligan, 2003) found that multiple-choice

questions aimed at lower order thinking may actually improve student engagement within the learning environment. For instance Mulligan (2003) found that using multiple-choice tests seemed to have a positive impact upon students' attendance, attention, and general study. Interestingly, several students from the courseware evaluation in this study pointed out that the games-oriented multiple-choice questions would play an important factor in maintaining their motivation, even if they address lower order thinking skills such as recall and memorisation. In contrast to this, one instructional designer was strongly against the use of games-oriented multiple-choice questions, because of the fact that they addressed lower order thinking skills. Further research into learners' perspectives behind the use of multiple-choice questions for lower order thinking would be helpful.

Statistically significant differences of opinion occurred within the learner-friendly component of the questionnaire data, according to age, gender, familiarity with teaching and learning online, and computer literacy. Participants from the youngest age group (18-29) require significantly less consultation in the development of courseware compared to those from the next age group (30-39). This may be because they are more comfortable in using the technology. This would be supported by the research of Howland and Moore (2002) whom found that participants' whom were more comfortable with using technology were more self-directed in their learning. Participants from the youngest age group (18-29) and with the highest levels of computer literacy were also more supportive of designing courseware to accommodate different learning styles, and mixed-media modes such as text, graphics, voice, and video. This may be because they spend more time on the World Wide Web, and have stronger demands of it compared to other groups. Further research would help establish whether this theory holds true. Participants from the older age groups of 30 and over were significantly more supportive of courseware being based upon educational philosophies and principles compared to those aged 18-29. This may be because younger participants are more comfortable in using the technology as a tool, and believe the educational design of courseware is somewhat less important than those whom are less comfortable with using the technology as a tool. Participants with the most familiarity with teaching and learning online were significantly more supportive of courseware being based upon educational philosophies and principles compared to those with little or average familiarity with teaching and learning online. This may be because they have more experience in using courseware, and are therefore more aware of the pitfalls of bad design. This could support Zaharias and Poulymenakou's (2003) belief that poor design is one of the reasons for dropout from eLearning courses.

Respondents with the most familiarity with teaching and learning are significantly more supportive of independent learning compared to those with average familiarity. This could be because they are more comfortable with using virtual learning environments. This belief

could be supported in the literature by pointing out that most researcher's supporting independent learning point out that learners' does not necessarily become independent learners until they are comfortable within their environment (Webb, 2008). Respondents with the most familiarity with teaching and learning online and the highest levels of computer literacy are significantly more supportive of courseware's providing of useful resources. This may be because they have more experience with using courseware, and see it as an important tool for supporting meaningful learning experiences. Further research would help establish whether participants' with more familiarity with teaching and learning and higher levels of computer literacy have different expectations of the online learning environment, and whether they use the online learning environment differently, compared to those with lower levels of literacy. Finally, females are significantly more supportive of using multiple-choice for assessment compared to males. The researcher is unsure why this may be the case, and suggests a further examination into this issue may help with providing an explanation.

7.4.4 Behaviourist and Constructivist-oriented Courseware Design

The data results indicate that there is a mixture of opinions on a behaviourist approach to design. The quantitative results indicate that participants are somewhat supportive of teacher-centered courseware in terms of direct navigational guidance and direct instructional guidance, however they are somewhat unsure about whether this should extend to an objectivist epistemology. The quantitative results show that although participants generally agree that a teacher-controlled environment with a high level of instructional guidance can be useful in courseware, they are not sure whether the course instructor should encourage knowledge recall and memorisation. Furthermore, when it comes to the navigational and directional structure of courseware, participants' supported both a high level of direction as well as open-endedness. Although this may indicate an issue with the design of the questionnaire, the researcher tends to believe that it is more representative of participants' belief that courseware can include both elements of teacher-direction (generally associated with behaviourism) as well as open-ended exploration (generally associated with constructivism). This is supported within the questionnaire data, with participants' requesting both a higher level of teacher-direction, as well as learner-control of their pacing. The indication that participants' are somewhat supportive of both elements of behaviourism and constructivism tends to indicate that elements of behaviourism and constructivism may be used as complementary toolkits. The concept that these epistemologies and their design features may be complementary toolkits is supported in the literature (Cronje, 2000; Rieber, 1993; Winn, 1997; Young, 1993). Nevertheless, further research is required in order to better understand the link between behaviourist and constructivist learning. Arguably, constructivism is still a relatively new concept to some universities, and the implementation towards constructivist learning may be slow. It could be that there is still a role for

behaviourist learning within contemporary courseware design. The question of whether there is a role for behaviourist learning was posed in the literature by Bain (2003) in “Slowing the pendulum: Should we preserve some aspects of instructivism?” The researcher was concerned about accepting the tenets of constructivism, without looking at whether the traditional role of teacher should be maintained. Stubbs and Watkins (2000) also recognised that the demands on students to be self-directed and constructive learners posed a problem for those learners whom wanted a high level of teacher-direction. It could be that courseware needs to be more adaptable to the needs of students, by providing for student-centered and teacher-centered direction, without promoting ‘drill and practice’. Further research is required in order to assess how this adaptable environment could be designed, and how it would be evaluated.

The analysis of the data indicated that participants showed strong support for the constructivist tenets of design, both within the questionnaire data and the courseware evaluation. The quantitative analysis showed that participants strongly agree courseware should use teaching examples that foster their prior knowledge of a subject, learn information in the context of that problem, and encourage problem-solving and embed learning within real-world examples. The open-ended questionnaire data showed that students had a strong requirement for active learning environments that encourage problem-solving, and wanted to see their learning being more relevant to the real world, through case studies, authentic activities, and problem-solving. The courseware evaluation showed that participants’ believed the strength of the design was the inclusion of a constructivist-learning environment, through the case study, which was anchored within a real-world problem, presented the complexity of that problem, reflection, the construction of knowledge, and collaboration with others. The positive reception to constructivist learning strongly supports the theory of constructivist learning environments. In particular, Jonassen et al (2003), and Jonassen, Cernusca and Ionas (2007) support a constructivist philosophy, and the design of constructivist learning environments for effective meaning making. They point out that effective learning environments should encourage ownership of the learning goals, active learning, construction, reflection, complexity and collaboration. This research indicates that the generally, the theory on constructivism translates well to practice. There were however some issues on the expectation of the learner to take ownership of their learning within the courseware evaluation. These will be discussed more fully in the next section, however is it is relevant to point out here that some students found the expectation on them to be self-directed through taking control of their learning goals to be a challenging concept. A few academics also pointed out that students whom prefer a high level of teacher control would find this difficult. Both students and academics pointed out that maintaining a level of face-to-face interaction and a close relationship between the student and lecturer would be essential in maintaining student motivation. The belief that teachers play an important role in

maintaining student motivation is supported in the literature. Felix (2001) found that disadvantages of using the web for student learning included the absence of a teacher and personal interaction.

When it came to collaborative learning the quantitative results showed that participants strongly agree that collaborating with others enhances learning, and they agree that discussion boards are an effective problem-solving tool. Nevertheless, the qualitative results show that students had mixed opinions about the role of collaborative learning. Although they did not negate the importance of collaboration, a couple of students indicated a dislike for activities which involve group collaboration, and preferred to work alone and contact the lecturer if they needed help. One student in particular said his motivation strongly decreased if he was 'forced' to collaborate with others. This tends to indicate that some students prefer personal constructivism (constructing knowledge at their own pace) as opposed to social constructivism (constructing knowledge through social communication). Trinidad and Albon (2003) point out that courseware should encourage collaborative learning such as paired group work, the sharing of information, and the constructing of data for use by other groups. This research doesn't contradict their findings, but it does point to the possibility that students need control over how collaborative learning should occur. Hung and Chee (2003) point out that learning should balance individual and social learning perspectives. Some students indicated a strong dislike to the use of discussion boards, particularly pointing out that they were sometimes ineffective because of the time it takes for teacher's to reply, and because of the lack of active participation by academics. Williams and Pury (2002) found that contrary to much of the literature their students did not enjoy participating in asynchronous discussion, regardless of whether it was optional or mandatory, although they did not view it as a waste of time.

The discussions from the courseware evaluation revealed that many participants believed the value of asynchronous discussions depended strongly upon the group at the time, as well as active lecturer participation. The importance of active lecturer participation in online communications is well documented in the literature (Wildner-Bassett, 2003; Byington, 2003). The quantitative results show that students agree chat technology could be an effective alternative to face-to-face communication, although academics and experts weren't sure. The qualitative results indicated that there was strong support for the use of chat technology. The researcher got the impression that many students would prefer synchronous communication to asynchronous communication, because they would be able to communicate in-synch with other learners and the lecturer. This contrasts to the findings of Warrick, Connors and Norton (2004) that found that students prefer asynchronous communication such as emails, to the use of synchronous chat technology. The coordination involved in agreeing upon schedules to meet online was seen as one of the reasons why

synchronous chat technology wasn't preferred. The feedback from the qualitative data in this research indicated that the active participation of other students and the online tutor would be a vital component in the success of online chat. Further research is required in order to assess whether synchronous chat is an effective tool for learning, including the barriers and requirements for success.

This research has looked at participants' perspectives on learner-centered and constructivist-oriented tenets. These tenets tend to centre on the design-concepts of open-endedness, the involvement of the student in co-constructing learning objectives, the importance of the learner in self-directing their learning, and the importance of fostering collaborative learning environments. This research has found that participants' opinions on these issues tend to be quite complex. On one hand participants supports both direct instructional guidance as well as open-endedness, clear objectives as well as co-construction, teacher-guidance and self direction, as well as independent learning and collaboration. Further research is required in order to fully assess whether learners support the implementation of a wholly learner-centered courseware, or whether courseware can implement both teacher-centered and learner-centered principles into practice. The courseware evaluation below goes some way towards answering this question. It may be that the concept of learner-centered courseware should be altered to reconsider the role of teacher from facilitator of the learning, to both instructor and facilitator of the learning. It could also be that behaviourism and constructivism can both be used as complementary toolkits, as suggested by researchers. For instance Cronje (2000) argues that these concepts are not opposing paradigms but complementing approaches. Lebow (1993) is more specific, and points out that a teacher who helps students apply behavioural design principles may do so in a way that is consistent with constructivist practices.

The quantitative analysis from this study shows that there are statistically significant differences for behaviourist and constructivist-oriented designs according to occupation, age, gender, institution, familiarity with teaching and learning online, and computer literacy. Females are significantly more supportive than males when it comes to supporting direct instructional guidance. This is probably because males prefer to be in control of their environment. Participants with the most familiarity with teaching and learning online are significantly less motivated by a lack of instructional guidance compared to those with little familiarity. This is probably because those with less familiarity with online learning environments need more direction. Academics and students from Education are significantly more supportive of an open-ended learning environment compared to instructional designers, as are students from UTAS compared to those from professional training environments. Further research is required in order to establish why this might be the case. Females are also significantly more supportive of an open learning environment compared to

males. Again, further research is required into establishing why females might be more supportive of both direct instructional guidance and open-ended learning environments compared to males. Participants from the youngest age group are significantly more supportive of the course instructor stating and enforcing their opinions, as opposed to encouraging the learner to express other understandings. This may be because they require a higher level of direction from the course instructor. This would be supported by the findings from the courseware evaluation, where a couple of academics pointed out that first year university students required higher levels of teacher-guidance, and were somewhat reluctant in accepting a more constructivistic approach to learning. It could be that younger students are oriented towards behaviourist strategies, and further research could assess whether this is the case. Participants with the highest level of computer literacy are significantly less supportive of the course instructor encouraging recall and memorisation, compared to those with lower levels of computer literacy. This could be because participants with lower levels of computer literacy require more instructional guidance, and are oriented towards behaviourist strategies. Again, further research could help assess whether this is the case.

Participants from aged 30-39 are significantly more supportive of constructivist learning (encouraging real world problem-solving and anchored instruction), compared to those from the predeceasing age group 18-29. Again, this could be because younger students tend to be oriented towards behaviourist learning, however further research is required in order to assess whether this is the case. Participants with the most familiarity with teaching and learning online are significantly more supportive of constructivist learning compared to those with little or average familiarity. This may be because they are more experienced with using courseware, and therefore less tolerant of drill and practice learning. This could be supported within the qualitative data, which shows that several participants with high levels of familiarity with teaching and learning online are strongly against behaviourist instruction, which they view as ‘boring’ and pedagogically ineffective. Finally, those with the most familiarity with teaching and learning online are significantly more supportive of collaborative learning, compared to those with little familiarity. This could be because they are more supportive of constructivist learning, and view collaborative learning as an important factor in both maintaining their motivation and contributing to their knowledge construction. This would support Neo and Neo’s (2007) finding that their students’ experiences in developing constructivist learning environments from a collaborative exercise, was effective for engaging learners, knowledge construction and complex problem-solving.

7.5 Courseware Evaluation

Some of the findings from the courseware evaluation have been presented above. The section below however contains additional information in regards to the research participants’ attitudes towards the user-friendly and learner-friendly design features. The design and

development of the courseware translated the theory into practice. The feedback from participants' provides a more comprehensive understanding of how important elements of the user-friendly design are, such as screen design and layout, navigation, and usability aids. It also provides an overview in regards to how participants' view a courseware designed from a learner-centered perspective. Finally, some additional and unexpected findings are presented, such as participants' belief that a post-evaluation of the courseware is important, and academics/experts' opinions on the barriers behind implementation of the design within a real-world situation.

7.5.1 Participants' Attitudes to the User-Friendly Design

The courseware evaluation indicated that screen design and layout is one of the most important features of courseware design. The screen design and layout played an important role in helping participants' feel 'at ease' in their learning environment. For instance, several participants expressed a sense of well-being with the simplicity of the introductory screens. The screen design and layout also played an important role in directing learners online. Participants' found the design of the homepage to be too cluttered and visually overwhelming. This prevented them from being able to orient them around the courseware effectively, and to use the features of the courseware effectively. For instance, many participants failed to realise that the 'Start Tips' button existed, because they were too overwhelmed by the clutter of the screen design and layout. This supports McCracken and Wolfe's (2004) general web design heuristics on the importance of avoiding clutter online. Nearly every participant had an issue with the graphic design and layout of the multimedia options on the homepage. The problem centered on the prominence and layout of the download buttons, compared to the size of the video screen. It was clear that if the multimedia options were graphically more sophisticated and consistent, and the prominence of the video was highlighted, that participants' would have been much more comfortable with the homepage, and able to use the courseware more effectively. This finding highlights the importance of courseware evaluation from a user/learners' point of view (Zaharias and Poulymenakou, 2006a; Nielson and Loranger, 2006). The courseware evaluation indicated that the visual design played a very important role in motivating learners', and engaging them within the online learning environment. This supports the quantitative finding from this study, which showed that attractive aesthetics are important for motivating learners. The courseware evaluation also supported the findings from the open-ended questionnaire data that the aesthetics of courseware be 'bright and colourful', as opposed to 'boring black and white' interfaces. Although one academic pointed out that students might not accept the unusually bright colour combination, every student in this study pointed out the strengths of the courseware was the bright and 'happy' colour combination. Students' requirement for bright colour combinations in courseware goes against traditional web heuristics that indicate that web sites oriented towards education use muted colour tones. Further research would

help reaffirm whether bright and attractive colours influence learners' motivation and usability online.

Participants did have issues with the contrast of colours used by the hyperlinks, finding it hard to read the name of the hyperlinks. They also found some of the clip-art graphics to be somewhat unprofessional, and would have preferred the graphics to be more representational of a real-world image. This supports Clark and Mayer's (2007) finding that objects should be depicted in a realistic fashion. The navigation of the courseware was one of the most-discussed elements of the courseware design. Participants liked the use of drop-down menus, however they found the range of menu options to be overwhelming. This may have been due to their perception that the design of the homepage was too cluttered therefore they had problems assessing the navigational capabilities of the courseware. In general however, they found the open-endedness and complete learner-control of the courseware to be overwhelming. There were many suggestions to deal with this, the most frequent being a redesign of the homepage or a sit-map which included a visual indication of 'where they've been', 'where they are', and 'where they can go'. Unfortunately, it was unclear whether the researchers' attempt to deal with the potential problems (through the first time tutorial, instructional video, and Start Tips) associated with open-endedness would be effective within a real-world situation. The preliminary evaluation suggested that the screen design and layout played the most important role in navigating learners' effectively, and that the existing design needed work. The problems associated with the non-linearity of the courseware, including disorientation and cognitive overload, were also found by Alomyan and Au (2004). Alomyan and Au (2004) point out that non-linearity is one of the basic features of hypermedia environments, such as courseware, however they also recognise that providing learners' with so much control gives some students problems such as disorientation, learner control problems, and cognitive overload problems. They suggest that not all learners may be suited to web-based learning due to their need for higher levels of teacher-guidance, therefore courseware should provide a more adaptable system that caters to learners' need for both linearity and non-linearity. A redesign of the courseware to include a visual site map indicating 'where learners have been, and where they can go', and a subsequent evaluation by a focus group would help assess whether students can learn effectively in a non-linear courseware.

According to participants, the courseware's usability aids such as the first time tutorial, site map, help section, and search tools were essential in helping them use the courseware. Most participants agreed that the first time tutorial was an important resource in scaffolding participants' use of the courseware. Nevertheless, one academic pointed out that most participants' would scan the first time tutorial, and that much of the information would be lost. This appeared to be indicated by several students, whom suggested that the courseware

also include the tutorial in the help section so that it is always available, even though the first time tutorial indicated that this is where the content would lie upon the first run-through of it. One student, whom suggested that the online collaborative tools might help aid students' usability, indicated the link between the user-friendly design and the learner-friendly design. This student suggested that the discussion board and chat tools could be used by students to trouble-shoot each other's problems. Several students pointed out that the optional facet-to-face component suggested in the courseware, would be essential in helping students run through the courseware with the lecturer, so that they are able to use it more effectively. This supports the quantitative findings that participants' believe teaching and learning online should maintain a face-to-face element as well as an online component. Participants' strongly supported the use of the download tools, which enabled them to download content according in a variety of formats and mixed-media modes. Several participants' pointed out that the accessibility options addressed different learner-styles, such as visual and audio learners, and that this was one of the strengths of the courseware. This supports the quantitative findings, which show that courseware should address different learning styles. Finally, it should be pointed out that one of the major problems with the courseware evaluation was that participants' were somewhat unsure about whether the courseware was effective from a learner's point of view, because they weren't using it in a real-world situation as a learner. Several students pointed out that their perspective strongly focused on how they perceive the courseware from a formative perspective, and highlighted the need to evaluate the courseware from a formative perspective.

7.5.2 Participants' Attitudes to the Learner-Friendly Design

Participants' viewed the learner-friendly design to be the strength of the courseware design. They were very supportive of the constructivistic approach to the courseware design, particularly the problem-based learning approach, where learners' are given control of their learning through a goal-based approach. This supports Jonassen's (2003a) theory that learners' should be given control of their learning through a goal-based approach to design, as opposed to the rigid construction of pre-designed objectives. Most participants' believed that the courseware's main strength lied in the inclusion of the case-study that was based on Jonassen's model for the design of constructivist learning environments. They particularly liked the way in which the learning environment embedded a complex problem within an authentic real-world problem, and provided them with a multitude of potential solutions, the potential for reflection and collaboration with others, and the option to explore the issue further by providing a range of mixed resources. There were mixed opinions on the level of instructional guidance provided in the courseware. Some participants liked the high level of flexibility and learner control, however others wanted more teacher-guidance in terms of the navigational structure of the courseware design. Alomyan and Au (2004) found that giving learners' too much control may lead to disorientation and cognitive overload. Howland and

Moore (2002) also found that some students preferred a high level of learner control, whereas others preferred more direct instruction. It is unclear whether the tools designed to scaffold student learning were wholly effective, because participants' weren't using the courseware in a real-world environment, so they weren't sure how they'd use the courseware's scaffolding tools. Some of these tools included an instructional video, the ability to collaborate with others such as the course lecturer, and the option of downloading the course content in a range of accessible formats. A preliminary perspective shows that students were very responsive to the inclusion of the course content in a range of formats, and one academic also pointed out that he believed the strength of the courseware lied in the ability of students to access learning content this way. He did however point out the time consuming nature of developing the content, as well as students downloading the content. A redevelopment of the courseware where the course content can be downloaded within a single screen would be more time-effective for students. There was a mixture of opinions on the collaborative tools. One participant from Education believed that the integration of the collaborative tools within the environment paved the way from a rich community of learners to develop, where social construction of knowledge was fostered. This supports the findings of Chai and Tan (2006) that support the development of virtual networked learning communities. Nevertheless it is relevant to point out that the participant above was unsure about whether this community would develop, because he wasn't using it within a real-world situation.

When it came to the courseware's ability to foster independent learning, there was a mixture of opinions. Academics supporting learner-centered teaching strategies emphasise the importance of learners becoming independent self-directed students (Williams and Bialac, 2006; Hsi and Gayle, 2003). Nevertheless, the courseware evaluation indicated that not all students wanted to be independent learners, although they agreed that independent learning was probably important. One student in particular pointed out that she was strongly motivated by a social learning environment, where she collaborated with her peers and was directed by a teacher. She pointed out that she was a 'poor independent learner', and that maintaining a level of teacher-control was important to her. The finding that not all students support self-direction is supported in the literature (Howland and Moore, 2002), however further research could help assess whether students can become independent learners through scaffolding within constructivist-oriented environments. The research indicates that a constructivistic approach may enhance the ability for learners to become deeper learners. Participants' point to the problem-based approach to learning (providing students with ownership of the goals of learning), the provision of a range of virtual resources, the collaborative tools, and the inclusion of case-based activities based on Jonassen's research on constructivist learning environments all contribute to the potential for deep learning to occur. As they are not using the courseware from a real-world perspective, most participants

point out that they can't be sure whether deep learning would occur. One participant pointed out that the courseware facilitated the potential for deep learning to occur in a more sophisticated way than he has come across before. Nevertheless, despite the literature supporting deep learning through constructivist approaches to online learning (Mimirinis and Madhumita, 2005; McGee and Wickersham, 2005), the findings from this research indicate that not all students want to be deep learners. Several students indicated that they'd prefer to take a surface or strategic approach to their learning, preferring to recall knowledge rather than constructing it. This supports Howland and Moore's (2002) finding that not all students want to be constructivistic learners. Further research may reveal whether students whom take a surface or strategic approach to their learning can learn effectively within an environment that encourages them to be deeper learners.

The courseware evaluation showed that students, academics, and experts all responded differently to the inclusion of games based activities addressing lower order thinking, which were aimed to stimulate students' sense of fun and therefore engage them within the learning environment, as well as act as a form of self-tests for students. Students responded very positively to the inclusion of games-based activities, and some went so far as to say that these activities would be essential in maintaining learner engagement and motivation within the learning environment. Students did not appear to be worried that some of the activities were addressed at recall and memorisation, rather they suggested this would be an effective way to see if they could recall the knowledge covered within the content. Students' interest in games-based learning for learner engagement and self-testing strategies supports Prensky's (2002) research on the motivation of gameplay in courseware. Prensky points out that fun is a great motivator, and that games-based activities are an important way in which education can be fun. On the other hand, Neal and Normore (2005) question whether fun can enhance learning without reducing it to entertainment. Further research would help assess whether students' learn effectively through games-based activities, and whether activities addressing lower order thinking are received positively within a real-world situation. Interestingly, academics had a different view to the inclusion of games-based activities. They pointed to the time and cost involved in designing the games, and suggested that into this area is required in order to assess whether the extra effort would result in increased student numbers. This finding further supports the motif running through this study, which suggests that time and cost remain a significant barrier to the implementation of effective eLearning. One expert in particular was strongly against the inclusion of games-based activities aimed at lower order thinking, and called these activities 'suspect'. This contrasted to students' perspective that these activities were 'fun and engaging' and 'relevant to their learning'. Perhaps because the games were situated within a constructivist learning environment, the potential for the courseware to turn solely into 'edutainment' may be prevented.

All in all the theory on user-friendly and learner-friendly courseware designed translated relatively well in practice. The courseware evaluation however, showed the researcher that much more work was needed on the user-friendly design of the courseware, before is was usable. In particular, a redesign of the homepage is essential, so that participants are able to orientate themselves more effectively around the courseware. The impact of the screen design and layout on learnability was emphasised, when students did not realise that some of the tools intended to scaffold learning online existed. For example, the design of the Start Tips button looked too much like an advertisement, and students did not realise they could receive help here. This supports Neilson and Loranger's (2006) web-based heuristics that graphics should not look like advertisements. It is worth mentioning that generally, as Danielson et al. (2000) suggests, following general web-design guidelines are somewhat effective for designing courseware. Nevertheless, as Zaharias (2004) points out, general web-based guidelines need to altered to consider the context of learning, within an online learning environment. This was the case when it came to the aesthetic design of the courseware. McCracken and Wolfe (2004) suggest web sites should comply its visual 'look and feel' with the target industry. In this case, most web sites aimed at Higher Education focus on muted tones of blue or red. The qualitative results from this study indicate that students were much more motivated by bright colours, rather than muted tones. Further examination of this issue could help assess whether this finding occurs in other studies.

The theory on learner-centered research and constructivist learning environments translated well into practice. Nevertheless, the reception of the design features was varied. In particular, participants' were unsure about the open-endedness and level of self-direction and independence they were afforded. Interestingly, most participants suggested that redesigning the interface to include a visual site map of 'where they are, where they've been, and where they can go' could alleviate potential problems on disorientation and learner-control. This highlights Clark and Mayer's (2007) finding that visuals play an important role within online environments. Finally, it is relevant to point out that translating the theory to practice was somewhat overwhelming, because the literature on courseware design focused very specifically on either expert based guidelines or conceptual theory, and there was very little literature upon how these theories and guidelines can be implemented in a real-world-situation. Nevertheless, this provided the researcher with the opportunity to 'get creative', and emphasise to her, that despite Merrill et al.'s (1996) belief that instructional design is scientific, for her the process of design was partially scientific, but mostly an exercise in creativity.

7.6 Future of This Research

This research attempted to fill an important gap in the literature, by looking at some contemporary perspectives from students, academics, and experts on teaching and learning

online, user-friendly courseware design, and learner-friendly courseware design. The research also filled an important gap in the literature, by investigating whether participants' backgrounds influenced their opinion on teaching and learning online, user0friendly courseware design, and learner-friendly courseware design. The quantitative results found that statistically significant differences of opinion occurred between groups according to: age for online versus face-to-face learning; age, occupation, institution, and gender for navigation; age, familiarity with teaching and learning online, and computer literacy for usability and screen design; age for learner consultation; age and computer literacy for learning styles; age, familiarity with teaching and learning online, and computer literacy for learner design features; gender and familiarity with teaching and learning online for instructional guidance; occupation, institution and gender for open-endedness; age and computer literacy for recall and memorisation; age, institution, and familiarity with teaching and learning online for real world learning and higher order thinking; gender for multiple-choice questions; and familiarity with teaching and learning online for collaborative learning. This research filled a final gap in the literature through the design, development, and evaluation of a fully-online prototype courseware, based on user-friendly constructivist-oriented principles.

The outcomes of this study show that this research tended to generate more questions than it answered. The researcher suggests that further research could be conducted in the following areas:

- Investigating the effectiveness of synchronous chat technology in replacing face-to-face contact with the lecturer, and encouraging peer and lecturer communication within a fully-online courseware.
- Examining the impact time and cost constraints have upon the design of courseware, and the successful delivery and implementation of well-designed courseware.
- Investigating the impact time constraints have upon the quality of academics' online feedback, and whether synchronous modes of communication could be more effective than asynchronous modes of communication in terms of providing timely and effective feedback.
- Investigating whether instructional designers have a less positive attitude towards teaching and learning online, compared to students and academics and if so, looking at reasons why this may be this case.
- Examining whether younger students are more supportive of online participation compared to face-to-face participation and if so, looking at reasons why this might be the case.
- Examining whether the in-built design features of Learning Management Systems such as WebCT Vista inhibit the effective design and development of courseware, or

whether academics' use of Learning Management Systems could be improved through institutional support.

- Investigating whether younger participants require less navigational support and usability features and if so, looking at whether their familiarity with online materials is a contributing factor.
- Examining how students, academics, and experts' all define the concept of 'interactivity', and investigating specifically what the components of an 'interactive' courseware would contain.
- Further investigation into students' perspectives of multiple-choice questions for lower order thinking within courseware as a form of interactive games and self-test, compared to academics and experts.
- Examining at whether younger participants are more supportive of the utilisation of mixed-media modes such as graphics, text, video, and sound and if so, why this may be the case.
- Reaffirm whether other studies find attractive aesthetic design important for motivating learners, and whether bright colour combinations are preferred for online learning environments compared to muted tones of black, white, and grey for instance.
- Help establish whether participants with higher levels of familiarity with teaching and learning online, and computer literacy, have higher expectations of the learning environment, and whether they use courseware differently to those with lower levels.
- Establish whether gender plays a role when it comes to the support of using multiple-choice for assessment.
- Further investigation to help understand the links between behaviourism and constructivism, in particular can these two design concepts be used as complementary toolkits, and if so how would this occur in a real-world situation?
- Further investigation to looking at how online learning environments can effectively cater to students' needs for both learner control as well as teacher-instruction. In particular, looking at how an adaptable learning environment could be designed, and how this would be evaluated.
- Further research in regards to whether learners' support the implementation of a wholly learner-centered courseware as designed for this study, or whether elements of teacher-centered approach should be incorporated into a learner-centered approach, to take into account the potential problems on students' need for instructional guidance and direction.
- Establish whether students and academics from Education are more supportive of open-ended learning environments, compared to instructional designers in particular, and why this might be the case.

- Establish whether females are more supportive of both direct instructional guidance and open-ended learning environments compared to males, and why this might be the case.
- Establish whether younger students are more supportive of behaviourist instruction and if so, why this might be the case.
- Investigate whether participants with lower levels of computer literacy require more instructional guidance and are oriented towards behaviourist strategies and if so, why this might be the case.
- Investigating whether age and familiarity with teaching and learning online plays a role in regards to the level of support students have for constructivist learning environments.
- Investigate whether students whom are dependent learners, may become independent learners through scaffolding within constructivist learning environments, and how this might occur within a real-world design.
- Investigate whether students whom prefer a surface or strategic approach to learning may learn effectively within an environment that encourages them to become deep learners, and whether they may through practice become deep learners.
- Undertake research into whether students' learn effectively through games-based activities, and whether students within a real-world situation receive activities addressing lower order thinking positively.
- To assess whether time and cost remains a significant barrier to the implementation of design features that engage and motivate students, such as games-based learning activities.
- Investigate the design, development, and evaluation of other fully-online courseware based upon user-friendly constructivist-oriented principles, to assess whether similar findings occur in other studies.

7.7 Conclusion

This chapter has provided an overview of this research, and an investigation of the research journey at its conclusion. It presented some of the limitations in this study. An overall discussion of the findings was presented, according to teaching and learning online, user-friendly courseware design, learner-friendly courseware design, and behaviourist and constructivist-oriented courseware design. Relevant research findings from other studies were presented to highlight particular findings. In other cases the researcher was unsure why particular findings might occur, and suggested further research may help provide an understanding. An unexpected finding from this study, and a strong motif that run through both elements of the qualitative data (open-ended questionnaire and courseware evaluation), as the need for institutional support by universities, for academics in designing, developing, and facilitating courseware. In other words, the conceptual nature of this study looks at the

elements of well-designed courseware, however this study found that there might be barriers in implementing research. Geith (2003) pointed out in “The costs of learner-centered online learning: an exploratory case study” that technology can be effective in creating cost-effective learning experiences. Nevertheless, he also points out that academics need to be experienced. Thus institutional support is required in training and supporting academics in courseware development. Thompson (2003) found that academic commitment towards teaching and learning online was dependent upon institutional support, as well as professional rewards and personal satisfaction. The researcher believes that the barriers towards implementing effective online learning need to be addressed, before the findings of this study can be furthered into the practice of courseware design.

Another unexpected finding from this study was that significant differences of opinion occurred more often than the researcher anticipated, on teaching and learning online, user-friendly courseware design, and learner-friendly courseware design. Whilst there was often noticeable difference of opinion according to occupation, significant differences of opinion only occurred for questions relating to open-ended learning environments, the use of recall and memorisation strategies, learning outcomes, and the use of multiple-choice for assessment. In many cases however professionals often had a noticeable difference of opinion compared to students, or academics. The researcher got the impression that professionals were somewhat out of touch with the needs of students. Much to the researcher’s surprise, age, familiarity with teaching and learning online, and computer literacy appeared to play an important role in participants’ perspectives on courseware design. Within a classroom environment She and Fisher (2003) look at the role students’ background plays upon determining their success as learners. Zhu, Au, and Oswald (2004) looked at factors such as gender difference, computer literacy, social and economic situations of thirty students when it came to their attitudes on teaching and learning online. Further research however is evidently required into the impact of students’ backgrounds when it comes to their learning preferences online. This research indicated that the theory on the design of courseware translated well in the practice, however the courseware evaluation was essential in garnering students’ responses of the design, compared to those of academics and experts. Students’ opinions are one of the most important elements of this study, and can hopefully be considered when it comes to other studies involving user-friendly and constructivist-oriented courseware design.

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Appendices 1: Questionnaire

Dear Participants,

My name is Yasmine Howard. I am currently undertaking PhD in the Faculty of Education, University of Tasmania. My research topic is 'User-friendly and Learner-friendly in TESOL Courseware Development and Evaluation'.

The aim of this research is to examine the effectiveness of existing theories relating to the concept of 'learner-friendly' in educational media, and to develop these principles to develop a framework for learner-friendly courseware in Higher-Education.

A questionnaire is used to collect data for this research. It contains three short sections, and takes approximately 10 minutes to complete.

Please note, I use the term 'courseware' and 'educational media' to refer to: is a course (academic unit) that is delivered predominately online using electronic media and is Internet-dependent. It is designed to encourage learning, and it generally contains learning content, activities, resources, the ability to interact with instructor(s) and student(s) and a link to support services integrated with the courseware provider.

You are invited to participate in this study by completing this questionnaire and returning it at your earliest convenience in the enclosed pre-paid envelope to:

Yasmine Howard

Your help is very much appreciated.

THANK YOU FOR YOUR TIME AND CO-OPERATION.

QUESTIONNAIRE

Please place a cross ‘x ‘ in the blank space indicating your choice.

A-Biographical information of participants.

1 –Age

__a.18- 29 __b.30-39 __c.40-49 __d.50-59 __e. Over 60

2- Occupation

__ a. Academic, Faculty of Education

__ b. Academic, in other disciplines

__ d. University Student, Faculty of Education

__ e. University Student, in other disciplines

__ f(i). eLearning Professional: Instructional Designer

__ f(ii). eLearning Professional: Web developer

3- Institution

___ a. University of Tasmania

___ b. Other Australian University

(Please specify here: _____)

___ c. Professional Training Provider

4- Gender

__a. Male __b. Female

5- Familiarity with on-line teaching and learning

___ a. not at all

___ b. little

___ c. just fine, average

___ d. very much

6- Level of computer literacy

_____a. High (i.e. You *rarely* need help using a computer for basic academic use)

_____b. Intermediate (i.e. You *often* need help using a computer for basic academic use)

_____c. Low (i.e. You *always* need help using a computer for basic academic use)

B- Questions

Please indicate your opinion to each question by circling a number indicating your best choice.

1: Strongly agree
2: Agree
3: Not sure
4:Disagree
5: Strongly disagree

1. Learners should be consulted in courseware development	1	2	3	4	5
2. Courseware should be based on educational philosophies or principles	1	2	3	4	5
3. Courseware should accommodate different learning styles	1	2	3	4	5
4. Courseware should contain a range of mixed modes, e.g. text, graphics, video and sound	1	2	3	4	5
5. An open-ended learning environment should be present in a courseware	1	2	3	4	5
6. A teacher-controlled learning environment with a high level of Instructional guidance can be useful in a courseware	1	2	3	4	5
7. Direct instructional guidance to using the courseware is essential	1	2	3	4	5
8. A lack of instructional guidance decreases my motivation to use the courseware	1	2	3	4	5
9. Learners should be encouraged to be independent learners in using courseware	1	2	3	4	5
10. My motivation to learn is enhanced if I know precisely what the learning outcomes are.	1	2	3	4	5
11. Using teaching examples that fosters my prior knowledge of a subject enhances my understanding of a topic	1	2	3	4	5
12. Learners should actively participate in developing the course learning outcomes	1	2	3	4	5
13. Courseware should encourage problem solving and embed learning in real-world examples	1	2	3	4	5
14. Information about a specific problem should be learnt within the context of that problem	1	2	3	4	5
15. Multiple choice answers which entail a right or wrong answer are effective learning strategies	1	2	3	4	5

16. The course instructor should state and enforce their opinions about course content, rather than encourage the learner to understand and express other understandings	1	2	3	4	5
17. Discussion boards are an effective problem solving tool	1	2	3	4	5
18. Online chat is an effective alternative to face-to-face learning	1	2	3	4	5
19. Collaborating with other learners enhances learning	1	2	3	4	5
20. Learners should be given clear navigational directions when using the courseware	1	2	3	4	5
21. Courseware should utilise effective usability, e.g clear navigation and good screen design, help menu	1	2	3	4	5
22. Courseware should be flexible to learners	1	2	3	4	5
23. Courseware should provide useful resources for learning	1	2	3	4	5
24. Attractive screen design enhances my motivation to learn	1	2	3	4	5
25. Screen design and layout affects my ability to use the courseware	1	2	3	4	5
26. Courseware should include self-tests for learners	1	2	3	4	5
27. Online participation increases my motivation more than face-to-face participation	1	2	3	4	5
28. Well-designed multiple choice can be an effective assessment tool	1	2	3	4	5
29.Courseware should be used in addition to face-to-face interaction	1	2	3	4	5

C- Short-Answer Questions

1. What feature(s) of courseware would you like to see?

2. What feature(s) of courseware do you dislike the most?

THANK YOU FOR YOUR TIME AND CO-OPERATION